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Forthcoming Events.

FEBRUARY 15-26.

British Industries Fair, 1926:—Annual Fair at Birmingham and London.

FEBRUARY 19-20.

Inter-University Metallurgical Conference:—Meetings at the Birmingham University. Subject for discussion: "The Position of the Metallurgical Student in Industry."

Staffordshire Iron and Steel Institute:—Annual dinner at Dudley.

Institute of British Foundrymen.

FEBRUARY 20.

Lancashire Branch:—Ordinary meeting at Manchester. "Foundry Materials under the Microscope," Paper by C. F. Brereton.

Sheffield and District Branch:—Joint meeting with the East Midlands Branch. "The Application of Lifting Gear to Foundry Practice," Paper by H. H. Moore.

FEBRUARY 23.

Wales and Monmouth Branch:—Ordinary meeting at Swansea. "Pressure Feeding of Castings," Paper by Ben Hind.

FEBRUARY 25.

Birmingham, Coventry and West Midlands Branch:—Ordinary meeting at Birmingham. "Production of Light Castings," Paper by D. McQueen.

THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Secretary: P. J. Griffiths, 20, Fisher Street, Swansea.

Foundry Trades Equipment & Supplies Association.
Secretary: K. S. Bridges, Avenue Chambers, Southampton Row, London, W.C.1.

Standardising Foundry Equipment.

At a meeting of the London Branch of the Institute of British Foundrymen held last Thursday, Mr. M. J. Cooper put forward a series of suggestions for the standardising of foundry tackle, particularly that type which the foundries make for themselves. In the subsequent discussion the foundrymen present raised every possible difficulty against standardising, but their remarks failed entirely to convince us. If rammers, cast-iron moulding boxes, moulding box pins, spindles and the like could be standardised, as standardised they will be in the course of time, then the intrinsic worth thereof on this account alone would materially augment the value of each foundry, providing a common basis can be established. If a foundry is to be sold, and it was known that standardised plant was available, then it would attract serious buyers and tackle would cease to be sold at remelting prices. A further phase is that the foundry equipment houses would possibly be in a position to market a standardised product cheaper than it could be made in the foundry. We are aware that many founders consider as negligible the provision of foundry tackle. Under present conditions, whilst the cost may be deemed negligible, so, too, is the value. A moulding box made to a foreman's particular design may be suitable and present good points, but its value to other foundries, that is, in relation to the industry as a whole, is probably little more, than its melting price.

The case of spindles for sweeping up loam mould is illuminating, because to the best of our knowledge there is not one single model on the British market, but a French manufacturer has considered worth while to market a complete range.

In speaking of a simple thing like rammers, the speakers, at the meeting referred to, insisted that Mr. Cooper's proposed model would not cover the field. Surely any enlightened body of foundrymen could within an hour's sitting specify a standardised range which would meet every normal case. Actually they would do well to ask the opinion of the Industrial Fatigue Research Board, as they have for several years made numerous researches on motion studies, and would be in a position to specify average weight for average men.

Those in charge of jobbing foundries are the loudest in their denunciation of any attempt at standardising, yet they are obviously the people who need it most, because large scale quantity-production foundries are sufficiently large to standardise for their own production. Jobbing foundry owners have been known to borrow boxes from neighbouring plants, and the advantage of being able to fix in one's own pins and loose bars would on occasion be very advantageous. We are convinced that a good deal of weight could be saved on the average cast-iron box with but little or no sacrifice to strength.

Correspondence.

Liquid Shrinkage.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Will you kindly note the following *errata* in my Paper on "Liquid Shrinkage," published in your issue of February 4. Probably the fault is my own.

Page 86, col. 1, second line from bottom: "Allerman" should read "Allemann."

Page 88, Table I, the last three lines of the first part of the table should read:

Test.	First cast.	Last cast.	Difference.
4 ...	226 ...	223½ ...	2½
5 ...	229½ ...	225½ ...	4
6 ...	228 ...	222 ...	6

Page 89, col. 2, seventh line from bottom: "Fig. 7" should read "Fig. 8."—Yours, etc.,

J. LONGDEN.

11, Drumry Road, Clydebank, N.B.
February 9, 1926.

Moulders' Brads.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—My attention has been arrested for some time by the high figure foundrymen have been charged for moulders' brads, and on an investigation into the probable causes, I must confess that I am amazed at the results. How many foundrymen are aware that brads a few months ago were being freely sold in Scotland at 6s. 6d. per cwt. less than in England, thus in Carlisle the price per cwt. was 20s., while in, say, Dumfries, about 30 miles distant, they were being sold at 13s. 6d. This difference in price was not due to the proverbial keenness which is supposedly characteristic of Scotsmen, but to the operations of a combination of manufacturers called "The Nailmakers' Association." It appears that the Association was experiencing in Scotland competition which it did not relish, so after a solemn conclave, cut prices by 6s. 6d. per cwt., in Scotland, to defeat this competition. Last November, the Association seemed to have felt that the opposition had received its quietus, and advanced prices to 20s. per cwt. Since this advance took place, another Gladiator has appeared in the arena, and after operating against the Association bull for a little more than a month, has forced it to give way to the extent of 5s. per cwt., in both Scotland and England. The reduction, therefore, of moulders' brads, which became effective on 1st inst., is not a gift to the foundrymen from the Association, but a grudged concession extracted from it by competition, which we are told on good authority, is the life of trade. Now, considering the quantity of brads used annually in Great Britain, would it not be worth while for the various Foundrymen's District Associations to consider the advisability of establishing a source of supply for themselves, independent of the Nailmakers' Association, either by direct operation, or by contact with a non-combine firm, on a cost, plus fixed profit, basis.

I am satisfied that so long as the Nailmakers' Association is allowed to dominate the situation, the price of brads will remain unreasonably high. It is quite clear that the policy of the Association is, in the long run, to keep up prices, and in the event of the Association winning the fight now waging, the price of brads would soon be on the upward grade again. The views of your readers on this matter would be interesting, and, even although no action is taken on the lines suggested by me, would perhaps prove salutary to the Association of Nailmakers.—Yours, etc.,

CORE GUM.

Beryllium.—Beryllium, a hard white metal, one-third lighter than aluminium and declared to have remarkable properties, may find an extensive commercial use as a result of the development of a process for its production at a cost permitting its use as an alloy with aluminium and other light strong alloys. Alloyed with copper, it makes a bronze of extreme hardness and of various brilliant colours. A pound of the metal formerly cost £1,000, it is stated, but now it is being offered at an arbitrary price of £40. However, it is believed that, with production facilities on a fair-sized scale, it can be made at £4 per lb. The rights to its manufacture have been sold to the Beryllium Corporation of America.

Propaganda Meeting at Middlesbrough.

Next Saturday, under the chairmanship of Mr. H. B. Toy, there will be held, at 6.15 p.m., at the Cleveland Technical Institute, Corporation Road, Middlesbrough, a meeting of local foundrymen to consider the advisability of forming a branch of the Institute of British Foundrymen locally. The promoters are Mr. S. V. Toy and Mr. N. D. Ridsdale. The meeting will be addressed by Mr. John Cameron, J.P., the president; Mr. V. C. Faulkner, vice-president and editor of the FOUNDRY TRADE JOURNAL; Mr. R. O. Patterson, past-president; and other officers of the Institute.

The meeting has been organised by Mr. Colin Gresty, honorary secretary of the Newcastle Branch, who has sent along posters to all the local foundries. If, by some chance, any have been omitted, they can be assured it is an oversight and that they will be welcomed at the meeting.

Foundry Query.

Gear Wheels.

We are casting a number of ring gear blanks, which, on machining, show pinholes, in some cases to ½ in. deep, varying in diameter from ¼ in. to the diameter of an ordinary pin. Also, when cutting the teeth, spongy flakes are found at the root of the tooth. The metal does not stand up, nor is the run solid. The metal used is Cleveland No. 1, Scotch, and scrap, in the following proportions:—30 per cent. Cleveland, 20 per cent. Scotch, and 50 per cent. scrap. The weight of the gears varies from 28 lbs. to 2 cwts. of the ring and spoke-armed section.

LEEDS.

The Refractories Dance.

The Annual Refractories Dance will take place at the Grand Hotel, Sheffield, on February 22, from 7.30 p.m. to 2 a.m. The dance will take the form of a Diner Dansant, and tables for four or six persons may be reserved. As the accommodation at the Grand Hotel is ample, it is hoped that members will bring their friends. Tickets are 15s. each (including dinner, but not wine), and early application is requested. Application for tickets (enclosing remittance) to be made to the Assistant Secretary, Mr. Arthur Whiteley, at 28, Blonk Street, Sheffield.

Pig-Iron by Air.

A consignment of Midhill selected Allmine special cylinder pig-iron was despatched by air mail to the Continent last Thursday. The senders, Messrs. British Pig-iron, Limited, of Abbey House, Victoria Street, Westminster, London, S.W.1, believe this to be the first occasion that the aeroplane service has been utilised for the transport of pig-iron. It serves to emphasise that some Continental firms believe that special British pig-iron is irreplaceable.

DR. KARL GOLDSCHMIDT, the inventor of the Thermit process of welding, died recently.

MR. T. HAGON, the secretary of Brown Bayley's Steel Works, Limited, Attercliffe, Sheffield, has been elected a director. Mr. Hagon started his career with the company 19 years ago, and became secretary in 1921.

MR. FRANK HUDSON, who was principal assistant to Mr. Oliver Smalley at the Close Foundry, Gateshead, of Messrs. Armstrong, Whitworth & Company, Limited, has been appointed metallurgist to the Wyoming Shovel Works, Wyoming, Philadelphia. He has been in America about two years, and has been associated with the American Brake, Shoe and Foundry Company, and the Warren Foundry and Pipe Company during this period.

Aluminium-Alloy Permanent-Mould Castings.—III.

By Robert J. Anderson, D.Sc.*

Disadvantages of Permanent-Mould Castings as Against Die Castings.

The die-casting process was originally developed for the production of castings in tin- and lead-base alloys; later zinc-base alloys were cast; and finally with the application of heat-treated special alloy steels for dies and the air-pressure method, aluminium alloys were cast. The die-casting process is especially applicable to the production of small interchangeable parts which do not need to be especially strong nor sound, but which are required to be well finished and accurate as to dimensions. Neither sand nor permanent-mould castings can ever compete with die-castings for quantity production in certain fields. The process has been applied very extensively to the production of small parts for automotive construction, household appliances, radio apparatus, adding machines, and many other purposes.

FIG. 1.—STEERING-WHEEL BRACKET (BY COURTESY OF THE KANT-SKORE PISTON COMPANY, CINCINNATI, OHIO).

FIG. 2.—STEERING-WHEEL SPIDER (BY COURTESY OF THE BRONZO ALUMINA CORPORATION, BUFFALO, N.Y.).

Die-castings are normally cheaper in price than permanent-mould castings, but this is not always the case. Much thinner sections of metal can be run in dies than in permanent moulds, and the die-casting process is superior for fairly large castings with thin walls. The permanent-mould process cannot compete in this field. In general, die castings are considerably more accurate as to size tolerance than permanent-mould castings. In some cases, this accuracy is misleading, since while the first few thousand castings run off a new die may be very accurate, the variations in size become considerable with further production. One great advantage of the die-casting process is the high speed of production which normally cannot be approached by other processes. The process will always hold the field for small and intricate parts which are not required to meet strength specifications.

FIG. 3.—BRAKE SHOES (BY COURTESY OF THE TOLEDO ALLOYED CASTINGS COMPANY, TOLEDO, OHIO).

Uses and Field of Application.

In the aluminium-alloy field, the merit of the permanent-mould-cast product has not been generally brought to the attention of the great field of possible consumers, nor have sand foundrymen given the permanent-mould process sufficient consideration. The fields of application, properties, and qualities of aluminium-alloy castings produced by the three main casting processes, viz., sand, permanent mould, and die casting, are markedly different. The permanent-mould process is broadening the market for light aluminium-alloy castings by furnishing a reliable product having a wide range of dependable mechanical properties and permitting the use of such castings for purposes hitherto considered out of the question for various reasons. It is the duty of permanent-mould-casting manufacturers to enlighten consumers regarding their products and methods of producing castings. This will tend to the co-ordination of the problems of consumers and vendors so that adjustments may be made in the customs of both, thus tending to the elimination of impractical and expensive designs, giving better castings at lower prices, and in general eliminating wasteful practices.

R. A. Bull, the well-known steel foundry expert, in discussing steel castings, recently pointed

* Consulting Metallurgical Engineer, Cleveland, Ohio, U.S.A.

out that "there are some buyers to whom the management gives more latitude in the selection of materials on a price basis than is economical." This is at least an eminently fair statement and might be made even stronger and still be quite fair. The modern foundry must be operated on the principle that the interests of the purchaser and vendor are the same, and in the aluminium-alloy field the purchaser of castings should know the comparative facts regarding sand, die, and permanent-mould castings, in order that the proper type of casting may be chosen consistent with

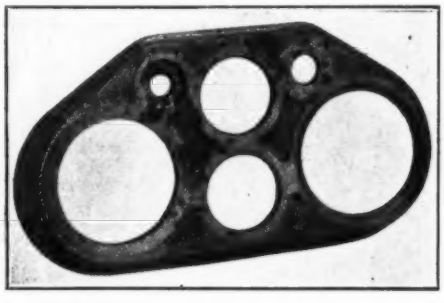

Fig. 4.—Instrument Panel for a Motor Car (by Courtesy of the Kant-Skore Piston Company, Cincinnati, Ohio).

the lowest costs. As mentioned in a previous article, the permanent-mould process, while old in principle, is comparatively new as a production method, but it has advanced rapidly in recent years, and is now a direct competitor of the sand- and die-casting processes in the production of light-alloy parts for several major industries. The process yields castings having well-marked and characteristic qualities, and the uses and field of application which are indicated because of these qualities are discussed in the present article.

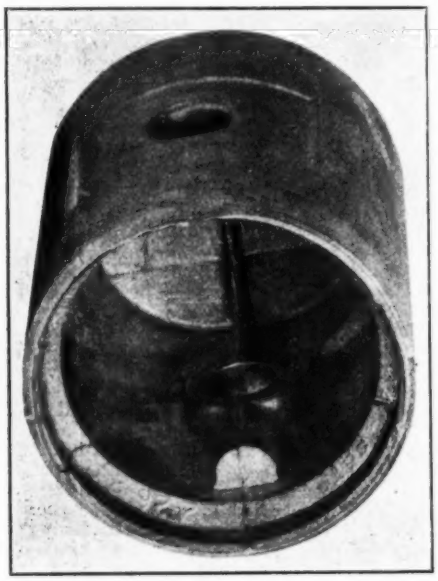

Fig. 5.—Piston for Motor Car (by Courtesy of the Kant-Skore Piston Company, Cincinnati, Ohio).

General Field of Application for Permanent-Mould Castings.

The fields of application for castings made by the three processes, viz., sand, permanent-mould, and die casting, are quite sharply defined in many cases, while in others they overlap. The sand-casting method is applicable to the most varied types of parts as regards size, weight, and shape.

As mentioned in a previous article, the permanent-mould process may be regarded as occupying a position midway between sand casting and die casting, when light aluminium alloys are considered, and it has a distinct field not covered by either. At the same time, it is a direct competitor of both the sand- and die-casting methods in the case of certain kinds of castings. There is little question but that many types of castings are made in the sand foundry which might better and more profitably be made by die casting, and it is also true that some castings are made in permanent moulds which should be made by die casting. On the other hand, some parts are made by die casting or in the sand foundry, which should logically be produced by the permanent-mould process. It is only possible to determine the correct method to employ by consideration of the type of casting to be produced.

Any alloy and practically any type of part *can* be cast in a permanent mould as in a sand mould, but it is often not feasible to attempt to make some types of castings. Of the various casting processes involving the use of metal moulds (including Cothias, centrifugal, and die casting), the permanent-mould process has the greatest scope and widest possible applications. The process cannot be considered for small lots of castings, nor at the present time for complicated castings or those with severe coring requiring a core with more than seven pieces, so that for making a relatively few parts, for general jobbing work, and for the production of large and complicated parts the sand foundry will probably always maintain its place. Broadly speaking, the field of applica-

Fig. 6.—Same as Fig. 5, but after Machining (by Courtesy of the Kant-Skore Piston Company, Cincinnati, Ohio).

tion for aluminium-alloy permanent-mould castings is any casting which is not too large, too intricate in shape, or having too thin walls, and where strength and soundness are primarily essential. Subject to these specifications, the field covers any casting where large quantities are desired, where special metallurgical requirements are to be met, where polishing is to be done, and particularly where heat-treatment is applied. In passing, it should be pointed out that permanent-mould castings are in competition with forgings where a superior product is required, but where the cost of producing a forging due to shape or number of pieces does not warrant its use.

As is known, sand-casting is used for the production of parts with difficult coring such as certain complicated types of vacuum-cleaner castings, cylinder blocks, and manifolds, and for large parts like crankcases, oil pans, and certain large parts used in the electrical industry. Some vacuum-cleaner parts, *i.e.*, motor housings and nozzles are now being made in permanent moulds, either with steel or sand cores. Sand casting is more economical when the quantity required is small owing to the low-cost of patterns as compared with permanent moulds. The die-casting process is especially applicable for use where dimension limits of 0.0025 to 0.004 inch per linear inch (assuming that the parts need not be especially strong nor sound)

will eliminate machining. Since very thin walls can be cast by the air-pressure process, there is a consequent saving of weight in parts. Holes can be cast to close tolerances by the air-pressure process. Where the limits of accuracy possibly for a part produced by die casting are not close enough to permit using the part without machining, the die casting loses its chief advantage. Die-casting is a very suitable process for such parts as spark- and gas-control levers, speedometers, magneto housings, and the like, as well as housings and large covers where a saving in wall-thickness is reflected in a saving of cost and weight. The superior mechanical properties of permanent-mould castings, owing in part to their relatively great soundness, permit the engineer to design to closer limits and thus effect considerable saving in weight.

The permanent-mould process is naturally always limited for economic reasons by the mould charge, and if this charge cannot be absorbed in a short time by savings in the cost of the castings, it is cheaper to buy sand castings. Thus, if a mould costs £100, and the actual production cost per casting is 4s., exclusive of the mould, then if one casting were made, it would cost £100 4s.; one casting of 1,000 would cost 6s.; and one casting of 50,000 would cost 4s. 4.8d. (assuming no repair charges in casting 50,000 pieces).

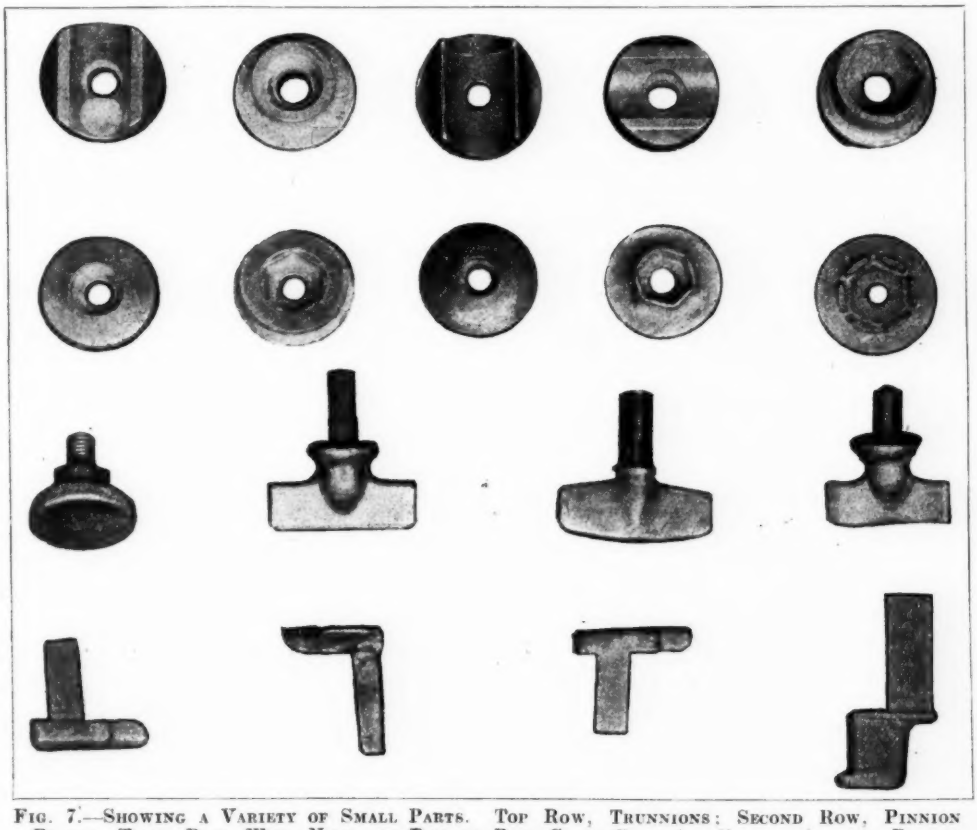

FIG. 7.—SHOWING A VARIETY OF SMALL PARTS. TOP ROW, TRUNNIONS; SECOND ROW, PINNION PLATES; THIRD ROW, WING NUTS AND BOTTOM ROW GLASS CLIFF (BY COURTESY OF THE BRONZO ALUMINA CORPORATION, BUFFALO, N.Y.).

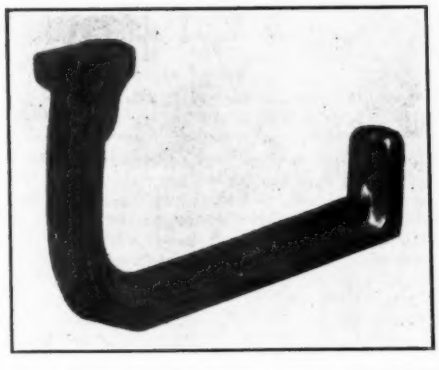

FIG. 8.—BRACKET FOR RADIO OUTFIT (BY COURTESY OF THE KANT-SKORE PISTON COMPANY, CINCINNATI, OHIO).

The use of inserts greatly broadened the field of application of die castings, and inserts can be cast in permanent-mould products. In certain cases, parts should be specifically made by permanent-mould casting instead of die casting, e.g., where human life would be endangered by the failure of a part. In certain cases, e.g., bearing caps and heavy, chunky castings, parts can be made more economically in permanent moulds than by any other process. There are many other

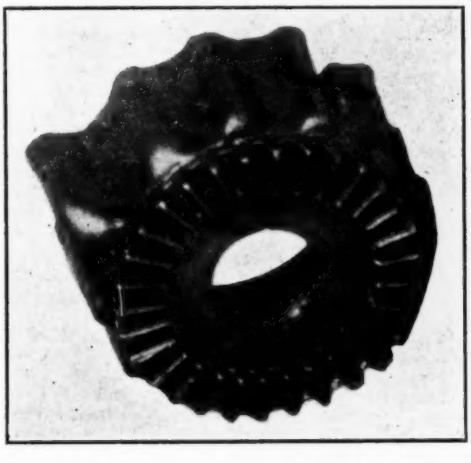

FIG. 9.—VALVE ADJUSTOR FOR MOTOR AIR CLEANER, WITH TEETH CAST TO SIZE (BY COURTESY OF THE KANT-SKORE PISTON COMPANY, CINCINNATI, OHIO).

cases where consumers now using sand castings would more profitably use permanent-mould castings if they were aware of the advantages of the latter.

There are various types and specific kinds of aluminium-alloy castings which should be made by the permanent-mould process in preference to sand founding or die casting. These include the following:—

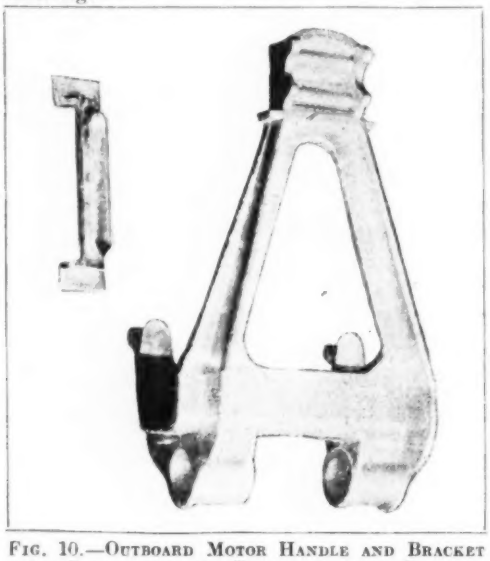

FIG. 10.—OUTBOARD MOTOR HANDLE AND BRACKET (BY COURTESY OF THE BRONZO ALUMINA CORPORATION BUFFALO, N.Y.).

(1) Various castings made in sand or dies that are not too complicated as to coring.

(2) Any casting being produced in sand or dies and having a wall thickness in excess of ¼-in. and with straight coring.

(3) Any casting, the proper functioning of which is responsible for human life or for the continued operation of machinery, such as steering-wheel spiders, automobile brake shoes, and aircraft fittings. (The die-cast steering-wheel spider is fundamentally unsafe, and this part should be cast in permanent moulds.)

(4) Any casting which must be leakproof to hold fluids such as pump covers, oil chambers, and covers, crankcase ends and plates, etc. (The permanent-mould process is also indicated for cream separator parts, cooking utensils, and washing-machine parts where liquids may enter cavities and cause corrosion, or decay, e.g., the souring of milk.

(5) Castings which although made by the air-pressure process must be machined to finish.

(6) Castings which are given very close inspection during and after machine operations, such as pistons for internal-combustion engines. (The die-casting process is not suited to piston production, and the percentage of machine-shop returns from sand-cast pistons would be much higher than from permanent moulds. There is great economic waste in the scrapping of castings after much labour has been expended on them for machining owing to foundry defects. Invariably, permanent-mould castings tend to be more free from the usual types of foundry defects than sand castings.)

(7) Castings which are to be finished by polishing and of which one of the chief selling points is appearance.

(8) Castings which must not change in shape or warp and move at the ordinary temperature on ageing should preferably be made in permanent moulds, rather than dies. Die castings are badly stressed internally owing to strains set up on casting. If such stresses had to be relieved by heat treatment, trouble would arise owing to blistering.

(9) Castings which are to be heat treated give superior mechanical values when cast in permanent moulds, over sand.

Considerable experimental work is now going forward in the direction of producing castings with complicated coring by the permanent-mould process, and vacuum-cleaner nozzles and fan housings are now being made by this method.

Specific Kinds of Castings Produced in Permanent Moulds.

Prior to a few years ago, the permanent-mould process, as applied for aluminium alloys, was used largely for the production of pistons, and the success of the process in this field gave impetus to the use of the method for other castings. Tests have shown that the permanent-mould cast piston is superior to the sand-cast product and also to the product made by casting in permanent moulds using sand cores. Sand-cast pistons pit more easily than the permanent-mould cast, due to greater porosity: the greater the porosity, the greater the area exposed to erosion conditions. Dynamometer tests by prominent motor-car manufacturers in the United States show that pistons made in permanent moulds with sand cores fail earlier than the permanent-mould cast pistons made with steel cores.

Many types of aluminium-alloy castings are now being turned out in regular production by the permanent-mould process in the United States, and millions of these castings have been made. Following is a list giving the types and specific kinds of castings being made:—

Castings Suitable for Making in Permanent Moulds.

Accessory parts, various.	Fishing-tackle pieces.	Plates.
Automotive parts, various.	Fittings, various.	Radiator caps.
Bearing caps.	Gasoline caps.	Radio parts.
Bearings.	Gasoline-pump valves.	Rotor castings, induction motor.
Brackets.	Gears, straight and bevel.	Spray guns.
Brake shoes.	Glass clips.	Steering-column brackets.
Brake-support plates.	Handles, door and other.	Steering-wheel brackets and parts.
Calculating-machine parts.	Hardware, automotive and small.	Steering-wheel spiders.
Camshaft bearings.	Household appliances.	Thumb screws.
Cooking utensils, and parts for.	Housing, gear and various.	Tool hardware.
Covers.	Instrument panels.	Trim pieces for motor cars.
Cream-separator parts.	Knife handles.	Trunnions, light.
Crankcases.	Motion-picture projector parts.	Vacuum-cleaner motor housings.
Dish-washer parts.	Motor end heads.	Vacuum-cleaner parts.
Distributors.	Motor parts, small.	Valve-tappet guides.
Drinking-fountain bowls.	Novelties.	Washing-machine parts.
Electric-drill parts.	Oil gauges.	Wheels, motor-car.
Electric-fan parts.	Outboard motor parts.	Windscreen parts, automobile.
Electrical-apparatus parts.	Percolator parts.	Wing screws.
Farm equipment.	Pistons.	

The greater part of the permanent-mould casting production has been used hitherto in the automobile industry, but there has been a definite expansion in the specification of permanent-mould castings by other major industries and the general engineering trades. The accompanying illustrations of Figs. 1 to 10, inclusive, show a variety of the various parts being made at the present time in permanent moulds.

THE L.N.E.R. COMPANY propose proceeding with a scheme for improving the railway facilities in the Frodingham district of Lincolnshire. The scheme includes the construction of a passenger station at Frodingham on a site a short distance from the present station; a marshalling yard with 20 sorting sidings and capacity for dealing with about 2,000 wagons, with shunting spurs; an enlarged goods and coal yard with new warehouses; construction of a new bridge over the line; a new western curve between the L.N.E.R. main line and the North Lindsey Light Railway.

Standardisation in Modern Foundry Practice.*

By M. J. Cooper.

In introducing the subject of standardisation in modern foundry practice, the author realises he is speaking before, perhaps, the most critical audience in the foundry trade. Covering a number of years' experience at home and abroad, the author has observed the disregard in all foundries to standardise tools, appliances, methods, and materials in every-day use, not only in small foundries, but in comparatively the largest establishments. Take as an example two men working adjacent to one another occupied on the same class of work, or even on identical patterns, it is not an uncommon experience to find them using boxes of quite different size and shape, articles for ramming which have no resemblance, size, shape or weight, to the generally accepted tools for the purpose. Facing sand, the colour of which alone is positive proof that the constituent parts are not of the proportions ruling in other parts of the shop for the same class of work, apart from the more or less coal dust content or amount of moisture contained, and, most important of all in the author's opinion, the degree of density with which the moulds are rammed. Even the size, shape and position of the runner and gate employed so vary that it makes one realise the lack of system, method, or more correctly described orderliness of mind prevailing throughout the foundry world, and more surprising still that all these multifarious methods are expected to produce one result, they do, and mostly an indifferent one. Having completed the mould, again the same multiplicity of methods are employed throughout the same foundry for securing the boxes against ferro-static pressure. Weights of all irregular size and shape are employed, cramps with and without packing and wedges, slotted pins and the destructive method of wedging the pins from the side of the moulding box, all find favour within an arm's length of the point of observation. Runner bushes or cups, whose shape and dimensions seem to have been designed solely to discharge the contents of the ladle in the first stages of pouring, anywhere but down the runner, and later to convey slag and kish into the mould along with the metal. Again wrought iron gaggers or lifters, or cast-iron ones—an expensive abomination wherever they are in vogue—as is also the Scotch system of wooden sticks, or soldiers, all are often employed in conjunction in many foundries.

Many methods of time booking and time taking on jobs, mostly on the same scale of efficiency to the regular conduct of the shop, and in a charitable spirit, let us say well-meaning but unreliable. Even in many foundries that have modernised, the atmosphere of the old Bohemianism of the foundry prevails, as witness by the flotsam and jetsam of the engineers' scrap bin, which one finds general about the foundry. Realise, then, the difficulty of a man, either journeyman or foreman, coming from one foundry to another, each foundry having its half-hearted system, or perhaps no system at all, the difficulty to regulate his mind and his methods to the new surroundings.

It is advantageous to consider some of the many workmanlike methods and appliances in the light of standardisation. If the foundries are to standardise in their costing system, they must consequently standardise their methods and general routine, and although such standardisation of methods as applied in the motor and allied trades cannot, perhaps be accomplished in general foundry work, many branches of the trade, and many processes in the manufacture of castings and the appliances used, do adapt themselves, if not to universal standardisation, to standardisation in individual shops.

Sand Density.

The first operation calling for standardisation in foundry work is the density to which the sand comprising the mould face should be rammed, especially in green-sand work, and this is most readily accepted by the moulder who has served his apprenticeship in an almost exclusively green-sand foundry. In dry sand and loam sand the properties of the sand are ruled by the grain size and clay content, but in green-sand work executed by hand or machine it is essential to control the density in addition, to produce satisfactory results.

There is now on the market an instrument which will register the density of the mould face in a similar manner to the Brinell test. Now when some test of this nature is in general use foundrymen may begin to consider sand standards or the relative values of sands in general use with a standardised sand. It is now accepted that the most suitable sand for foundry use are those having a grain-size ranging between 60 to 100 mesh to the inch and a maximum clay-content of 12 per cent., and a density to which a sand may be rammed is governed by the percentage of grain content lower than 100 mesh and to the fineness of the clay content.

The Preparation of Facing Sand.

There is but a very small percentage of foundries, large or small, properly equipped for the proper preparation of facing sand or loam. The standard foundry or sand mill should be provided with mechanism for lifting the rollers off the bottom of the pan immediately the sand has received sufficient milling or kneading, and it is just as essential for economy in H.P. and economy in time that a variable speed gear should be fixed. The conduct of new sand when in contact with metal frequently depends on the treatment it has received before reaching the hands of the moulder. The usual sand preparing installation is in the form of a mortar grinding mill, and the choice seems to fall on the self-emptying variety, and the greater the amount of sand to be prepared, the larger the mill, and as though the strength of the material changed in proportion to the amount required, the weight of the rollers is increased with the size of the pan and vary from 5 to 25 cwts. per roller. Speeds vary from 10 revs. per minute for pans 3 ft. 6 in. dia. to 60 revs. on pans 9 ft. dia., and *vice-versa*. Some mills are equipped with two plain-faced rollers or two cogged rollers, or, again, one plain and one cogged, and all this variation in speed, weight and design to accomplish simply the proper blending of the sand. Whether facing sand is being prepared or loam, on all these mills the speeds are constant, and with the self-emptying variety the mill goes on grinding the contents until the pan is emptied, and that operation is controlled by the condition of the scrapers which, following the low standard of foundry plant maintainance, is generally bad. Obviously part of the sand is properly mulled (or undermulled) and the other part is overground, and unless later put through a disintegrator, the result is better imagined than described.

In the author's experience a roller with a 12 in. face, the weight should not exceed 10 cwt. and the surface speed of the pans or rollers should not exceed 150 ft. per minute, for facing sand. After passing under the rollers for a short time at full pressure the rollers should be raised and the speed accelerated just to give the mulling action without reducing the grain size, and in the case of loam, the speed may receive much greater acceleration. By this means the sand will be prepared much more quickly and with a very considerable saving in h.p. Regarding the merits of cogged and plain rollers, much will depend on the class of material being treated. For rotten rock undoubtedly the cogged roller is a great advantage for breaking down the lumps, where the sand cannot be procured in the disintegrated state. At the same time, immediately the breaking down operation is accomplished it is very obvious the surface of

* A Paper read before the London Branch of the Institute of British Foundrymen, Mr. G. C. Pierce presiding.

the roller which comes in contact with the sand is very small, and therefore has a greater crushing effect, considerably varying the grain size.

The Standardisation of Rammers.

The most important item of standardisation is the foundry rammer, the density to which sand is rammed depends entirely upon the sense of touch of the operator, and this can only be acquired when the medium used is fairly constant in dimensions and weight. In many shops balance and weight of the rammer receive no consideration whatever, any old piece of scrap iron on the end of a rod varying in diameter from ½ to ⅞ in. and in weight from 5 lbs. to 14 lbs., is allowed for the purpose of ramming, and to make it more awkward when it is not in use as a rammer it is the first article seized upon for a lever or as an adjunct in breaking up the foundry scrap. Pegging rammers for general floor work should be standard at 7 lbs., with a tolerance of 2lbs.; that is, + ¾ lbs. for heavy dry-sand work and − 1¼lbs. for light green sand, with a stale diameter of ¾ in. × 54 in. long. This is set out in Fig. 1. Flat rammers may have the same

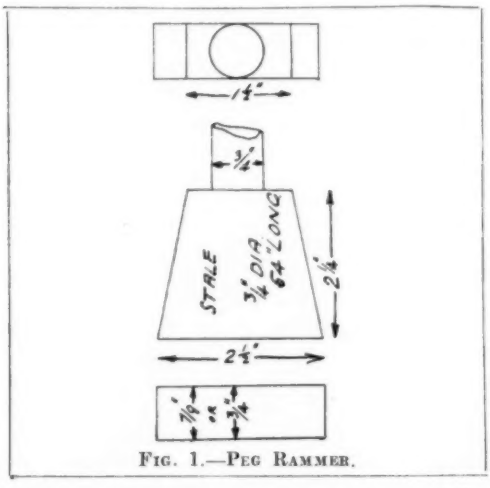

FIG. 1.—PEG RAMMER.

tolerance; the standard should be 9 lbs. + ¾ lbs. and − 1¼lb., the stale to be ¾ in. × 54 in. long. A rammer is much better on the light side, being more easily manipulated, and the density of ramming being accomplished by the variation in the length of the stroke, or the little extra force put into the downward blow. A flat rammer, upon which one might usefully standardise, is shown in Fig. 2.

The Design and Construction of Moulding Boxes.

There is urgent need for standardisation of moulding box equipment of all sizes, dimensions and thickness, weight for single-handed and double-handed operation, size of pins, snugs, handles and bar space.

It is quite common to see boxes 12 in. sq. × 4 in. deep and ⅝ in. and ¾ in. metal, and the author has seen boxes 4 ft. square, designed by a foreman pattern-maker in the dual capacity of foundry manager (within the last two years), for use with a jolter, with sides of 1¼-in. metal, and beyond the power of the machine to bump. It is suggested that for plate or machine work for maximum single-handed lift, the box and sand content should not exceed 1 cwt., and such boxes, say up to 20 in. × 12 in. × 4 in. deep, or 24 in. × 10 in. × 4 in., or 16 in. × 16 in. × 4 in. deep, should not exceed ⅛-in. metal with radiused corners giving equal metal throughout the box, and handles of mild steel not less than ⅝ in. dia., and pins for plate work and general use, not less than ¾ in. dia. and 3½ in. long from the shoulder, to be made of mild steel with 0.01-in. clearance on the diam. and tolerance on the lines of the "Newall" running fits, allowing a lead at the top of the pin of 1/16-in. taper in ¾ in. All snug holes should be jig drilled and reamered to standard dimensions with snugs at least twice the thickness of the diam. of the pin.

For all double-handed boxes (two men) and crane boxes up to 6 ft. sq. it is advisable to have 1in. diam. register pins, with the same tolerance as the smaller pins, and on all crane boxes it is a considerable advantage to have the pins case-hardened. For deep lifts 9 in. and upwards, 1/32 in. taper to 1 ft. should be allowed to within, say, 2½ in. from the shoulder, which portion should then be parallel and have the usual 0.01-in. clearance. For double-hand boxes (two men) to be lifted about by hand when rammed, the handles should not be less than 1¼ in. diam. × 5 in. long; handles of less diameter cut into

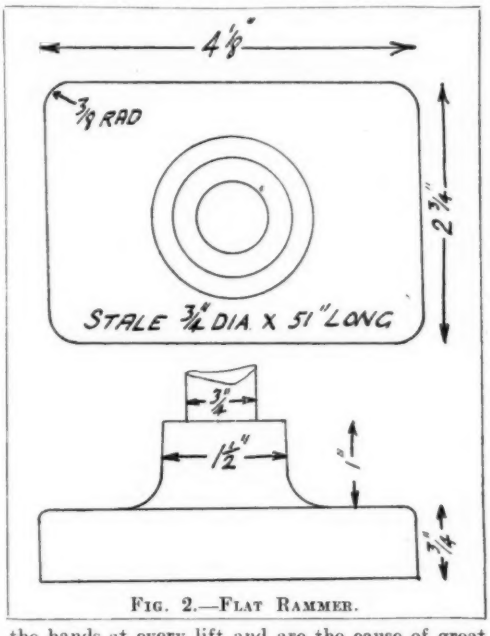

FIG. 2.—FLAT RAMMER.

the hands at every lift and are the cause of great discomfort. Again, the handles for a double-handed lift shall be kept within reasonable limits of spread, and as near 21 in. as possible for comfortable working. On moulding boxes above the single-hand type and containing cross bars it is advisable to have four snugs, which may serve the dual purpose of taking the register pin and for clamping the box against ferro-static pressure. Cross bars should have a standard distance of 5 in. clear minimum, and may with advantage increase to 6 in. on large crane boxes, and on all composite boxes the bolt holes for securing all bars and group bars should be not less than 7-in. centres. A bar space of less than 5 in. will not allow the pegging rammer to work properly between the lifters, and flat ramming with a standard flat rammer is out of the question. Larger moulding boxes (top parts) of the crane type, in addition to having circular or radiused corners, should have the cross bars proportionately as near the same strength as the outside frame as far as possible to minimise contraction strains, and all lifting handles or lugs should pull longitudinally with the cross bars. For boxes above 6 ft. square it is desirable to have the outside frame channel section, for in addition to increasing the strength with a saving in weight, it is a great advantage when securing the boxes with cramps against ferro-static pressure.

All boxes above 6 ft. square should have the corners split with splitting plates and later fitted with another thicker plate to secure with suitable bolts.

In designing boxes of a heavier type the author favours the composite construction, that is an

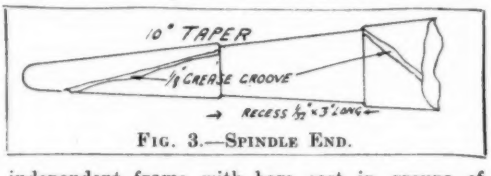

FIG. 3.—SPINDLE END.

independent frame with bars cast in groups of three or four. This type of box possesses numerous advantages, a group of deep bars may be substituted for a group of shallow bars, or bars of special shape to suit the contour of the pattern, and wherever the class of work warrants

it, provision should be made in the design of the boxes generally for bolting end and end, for instance, three 6-ft. square boxes would build a box 18 ft. × 6 ft., or two boxes would build a box 12 ft. × 6 ft., this, of course, necessitates all bolt-hole centres being made standard.

Where trunnions or swivels are provided, and if cast as part of the box, these should have a suitable mild-steel chill cast through to make the metal homogeneous throughout.

Standardising the Equipment for Loam Moulding.

In the general run of spindle work, but three sizes of spindles are required, 2, 3, and 4 in. dia. These may vary in length according to the class of work produced, but the diameters cited should be strictly standard, and more important still is the adoption of a standard taper, say an included angle of approximately 10 deg. or 1 in. per ft., and the length of taper should be say 8 in., and a recess 1/32-in. deep and 3 in. long should be turned in the taper length to reduce the friction and the addition of a slightly spiral grease groove is a great advantage. This is shown in Fig. 3. Master spindles should be provided for the casting of crosses or spindle centres.

Speaking generally, very few foundries have adopted a standard taper for spindles, and the confusion and waste of time arising from this disorderly way of working is only known to those actually employed in matching a spindle and

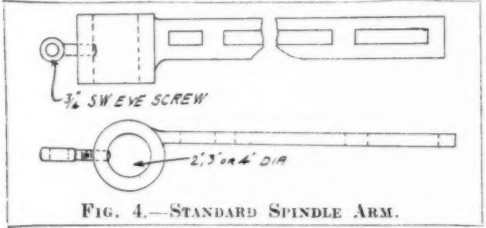

FIG. 4.—STANDARD SPINDLE ARM.

plate once they have been separated, and in the long run generally results in a new plate having to be cast. Again it is quite usual where a standard C.I. arm is not in use for spindles to vary in $\frac{1}{8}$-in. from any diameter to any diameter, consequently when the mould goes into the stove to dry, the board, the arm, and the spindle must be kept intact, otherwise the whole operation of setting the arm and the board has to be gone through again involving a considerable amount of extra work. There is almost as much variation in spindles and spindle arms as there is in rammers, and loam work, always an expensive and untidy process, is made doubly so.

In Figs. 4 and 5 are shown varieties of spindle arms upon which standardisation is desirable.

Runner Plugs.

Runner plugs whose design promotes the very trouble for which they are employed to overcome, that is to prevent sand and dirt being carried down the runner with the first flush of metal, instead of which very frequently the face of the plug is so large that the power of suction disturbs the sand at the bottom of the runner basin upon which they repose and the displaced sand is carried down the runner and into the casting to be attributed to dirty metal, dirty moulds and eutectic excesses of all kinds. The general run of so-called runner plugs is an article of utility, they are invariably of a design like a flat rammer with a more or less flat surface 3 in. sq. or 3 in. dia. upwards. They act as occasion demands, as a runner plug, as a flat rammer, etc., but when doing its best service is used heated as a drier for redrying damp patches on cores after making up lifting hooks. The standard runner plug, submitted in Fig. 6, should follow the lines of the standard mushroom valve, but the seating should be deeper, and the included angle of the seating should be a little less than the plug.

The seating may be made from a loose or separate core for a dry-sand mould, or in the case of a loam mould sufficient loam may be secured on the top plate and the seating pattern bedded in the loam and dried in position.

Skimmers.

Skimmers of all weights and sections of bar iron either too heavy comfortably to manipulate or too short and narrow to be effective are accepted as being good enough, and two or three bad castings of comparatively light weight will pay for all the new skimmer iron required in the average large shop in a year. For shank or light

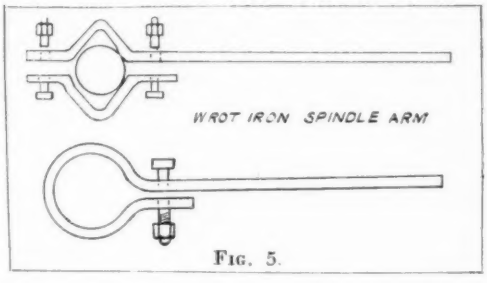

FIG. 5.

ladle work the most convenient section of merchant iron is $1\frac{1}{4} \times \frac{1}{4}$ in. and cut to 6-ft. lengths; this will allow ample to turn for the skimmer head, and a reasonable surplus for wear and tear. And for skimming a crane ladle, when pouring a $\frac{3}{4}$-in. dia. piece of rod or piping 6 ft. long to which has been welded a head in the form of a scimitar, say, 18 in. long and 3 in. deep in the blade, will trap a wide surface and adjust itself to varying sizes of ladles. Undoubtedly for skimming the slag and kish off a ladle at the cupola a standard boiler rake is difficult to improve upon.

Where individual attention cannot be given to casting small work which has to be machined and where metal is caught direct from the cupola a perforated skimming spoon is essential.

Runner Bushes or Cups.

For general jobbing, small work and plate and machine work requiring a head of metal the circular C.I. bush or cup, if properly lined or made upon a C.I. bush maker, is worth standardising, and if made in two sizes, will cover a big range of work. One, say, $4\frac{1}{2}$ in. dia. × 3 in. deep, and another $5\frac{1}{2}$ in. inside dia. and 4 in. deep, with a thickness of 3-16 in. to 5-16 in. taper metal, allowing a lining of $\frac{1}{2}$ in. sand at the bottom and with $\frac{1}{4}$ in. at the top, and for heavier work a very useful size is rectangular shape 8 in. × 5 in. × $3\frac{1}{2}$ in. deep, with a metal thickness of $\frac{1}{4}$ in. at the top and $\frac{3}{8}$ in. at the bottom, made up on a bush maker to leave a sand lining of $\frac{3}{4}$ in. at the bottom and $\frac{1}{2}$ in. at the top.

Dressing.

In very few foundries does the dresser receive any consideration in the provision of tools, generally improvising his own from anything likely lying around. The standard dresser's hammer is $1\frac{1}{4}$ lb. (a fitter's is $1\frac{1}{2}$ lb.), but it must be remembered that with a lighter hammer the dresser does more than double the strokes to the minute than the fitter and maintains the speed continually throughout the day.

A dresser's standard chisel may be hexagon or oval in shape, but preferably oval, 10 in. in length and $1\frac{3}{4}$ lb. weight, hex HB across the flats and the oval $\frac{7}{8}$ in. × 1 in.

Cupola Practice.

The standardisation of cupolas and their equipment is long overdue. The waste of power due to high-pressure blast, small diameter supply pipes and small, badly-designed tuyeres, and ignorance in regard to volume of air passing through the cupola. Ample practical and laboratory data is available to demonstrate to the least observant what a wasteful factor in castings production the average cupola is, and in the provision of blast piping capacity it is obvious that there is not as much consideration given to the matter as by the average plumber when providing rain-water pipes to house property. A deep crucible, a short body and a fan like somebody else's is the usual equipment. There is a greater leakage taking place in foundry work from careless cupola practice than in any other department of foundry work. It would be almost an utter impossibility for some foundries to produce reliable castings however

high grade the materials used, and the cupola and equipment may have been quite an expensive item and supplied by firms whose name is a household word, as instance the number of years during which innumerable cupolas have been equipped with a blast-pressure gauge, an instrument which signifies nothing in regard to the essential requirements for melting, except to denote that the fan is still running. Only by the use of a volume gauge is it possible to control the standard of output. Foundries weighing coke and iron charges and measuring depth of bed before the first charge is put on and with proper supervision of backing sand, and in many cases would be better left out—irregularity of grain size, amount of ash and sulphur content being some of the many bad qualities. Plumbago is so highly adulterated and of so coarse a texture that it just defeats the very purpose it is supposed to fulfil, and during recent years it is no uncommon thing to see the top surface of a casting grained like a cloud, the result of the plumbago having washed from the bottom surface and sides of the mould, while ordinary blacking is just a mass of volatile matter not having even the properties of common soot. And the author has frequently used coregum that, when mixed with water, it has immediately settled in the form of sand, and whose glueing properties were useless. All this sort of thing causes irregularity in consumption and introduces waste not only in materials, but is a very frequent source of continuous waster castings and serious worry to the user.

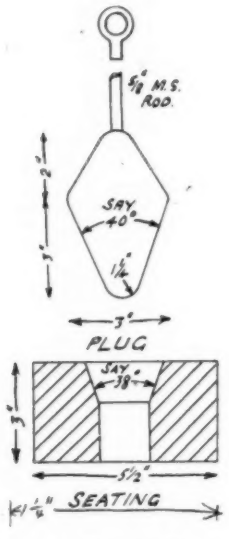

FIG. 6.—RUNNER PLUG.

tenters, and a daily record of iron and coke consumption or castings produced per ton of metal melted are few and far between, and a few rough test pieces cast daily and observed for appearance of fracture would alone help to standardise production. Some foundries carefully weigh the iron, but not the coke; others the coke and neglect the iron, whilst still others only weigh the limestone because that is the capacity of the available scales. The author is convinced that a good material result in 75 per cent. of British foundries is the outcome of accident, and the comparisons of metal melted and castings produced would disclose the excessive amount of metal wasted in heads and runners.

The Standard Foundry Crane.

The type of electrical crane in use in the machine shops when placed in a foundry can only be described as a makeshift, and is as much a foundry tool as a mortar grinder is to a sandmill, and lacks many desirable features of the old hand jib crane. A creeping gear is an essential feature to every motion of a foundry crane, and unless possessing this feature, is a very destructive agent and a constant source of danger. The prevailing type of crane in foundry use, functions by a series of jumps and jerks at every operation, with the result that register pins are bent, snugs broken, and the time spent in many foundries in repairing broken moulds through bad lifts would alone pay for proper lifting equipment in a matter of months. At casting time the amount of scrap made about the floor through the difficulty of crane manipulation and castings spoiled through runnerbox displacement amounts to a considerable item in the course of a year.

Standardisation of Foundry Accessories and Materials.

Lack of foundry standardisation in foundry practice is most keenly felt by the foundryman in the supply of raw materials and accessories. There is very urgent need for a standard to be established in the properties of coal dust, blacking, plumbago and coregum.

Quite a lot of the coal dust supplied is totally unsuitable for the purpose of mixing with moulding

Catalogues Received.

Cast-Iron Pipes.—The monthly stock list issued by the Staveley Coal & Iron Company, Limited, Chesterfield, for February is now available.

Foundry Supplies.—Messrs. Thomas Wilkinson & Company, Limited, of Stockton Street, Middlesbrough, have sent us an advance copy of their latest price list. The field covered embraces blackings, coal dust, plumbago, core gum, glutrin, molasses, Thames loam, sea sand, red mould sand, straw ropes, studs, nails, chaplets, coke baskets, bellows, riddles and brushes.

Foundry Supplies, etc.—The firm of Durilla, Limited, 148, Victoria Street, Burton-on-Trent, have sent us details of several specialities they have prepared for the foundry industry and allied trades. They have brought out a case-hardening compound (Durilla), and iron cement (Durilla) and a core binder (Porosit). Another speciality is the provision of coloured pencils for marking on metals, sacking, art paper, glass and most other substances.

Core Binder.—Messrs. Arthur Newsome, Limited, of Burley-in-Wharfedale, have prepared a 12-page art booklet which outlines the mixtures to be used when making various sorts of cores with glutrin. Copies are available on application to the stockists, the Blackfriars Foundry Requisite Company, Limited, 34-35, Norfolk Street, London, W.C.2; Thomas Wilkinson & Company, Limited, Stockton Street, Middlesbrough; and Albert Smith & Company, 60, St. Enoch Square, Glasgow.

Swedish Iron and Steel.—The Swedish Consul General in London has sent us a copy of a booklet bearing the above title, which contains a very interesting article by Professor J. A. Leffler, on the metallurgy of Swedish iron and steel. We think, however, the professor has started off with the correct assumption that Swedish material is excellent, and has then built up his theories around this axiom. Considering this is a foreign production, the English is excellent. We imagine that a letter sent to Axel Forsse & Company, Limited, Stockholm, Sweden, will secure a copy.

Sand Mixing Plant.—Messrs. Binders International Company, Limited, have sent us a four-page folder and blue print of the well-known Ketin and Thiriart sand-preparing machine. It will be remembered that this machine is surmounted by a rotary sand mixer, which prevents any extraneous matter reaching the mixer-miller. This is provided with three conical rollers and an automatic spraying arrangement. After milling the sand is automatically fed into a vertical aerator, all the operations being conducted in one self-contained unit. The machine is capable of providing from 2½ to 3 tons per hour, and is reasonably portable. When loam is being prepared, there is an arrangement for eliminating the aerating process. The combined machine is an interesting proposition and the descriptive pamphlet well worth studying.

MEETINGS OF THE SHAREHOLDERS of the Shotts Iron Company, Limited, are to be held on February 23 and March 11 to consider a resolution to increase the capital to £800,000 by the creation of 200,000 new shares of £1 each.

The Institute of British Foundrymen.

LANCASHIRE BRANCH.

The annual dinner and attendant functions in connection with the Lancashire Branch of the I.B.F. took place on January 13 at the Grand Hotel, Manchester. In the afternoon a meeting was held, presided over by the Branch President, Mr. J. Masters, at which a lecture entitled "A Day in the Foundry" was delivered by Mr. J. G. Robinson, of Halifax. Mr. John Cameron, J.P., the National President, was present. Ladies had been specially invited to attend and formed a large proportion of the audience, and the lecturer, making free use of lantern slides and employing non-technical language, succeeded admirably in his endeavour to interest them in an instructive description of the work carried out in a foundry.

Mr. Robinson showed the materials used and their products—ore, slag, limestone for fluxing purposes, coke. Passing on to the apparatus he exhibited slides showing the tapping barrow, cores, moulds, cupolas, core stoves, with and without a producer. Working with and without a pattern was described. Other slides showed the procedure adopted with various castings.

Mr. J. Cameron said the lecture had taken them right through, beginning with the iron ore and finishing with the casting, and it gave a clear idea of a day's work in a foundry producing a good class of work. Internal combustion castings, such as those shown, were of the highest class. Some foundries were very untidy, but it was not a necessary result of the work. He had been into a foundry run by the late Mr. Broughall which was so extremely tidy that he was amazed.

A vote of thanks to Mr. Robinson was proposed by Mr. A. L. Key and seconded by Mr. Makemson (Branch secretary), who stated that this was the third occasion in a little more than a year on which Mr. Robinson had given a lecture in connection with the Lancashire Branch.

THE DETROIT CONFERENCE.

MR. V. DELPORT said as the representative in London of the American Foundrymen's Association he thanked the President and Council for giving him the opportunity to address one of the leading Branches of the Institute. During the last few years it had been his privilege to follow the work of the organisation: he did not think he had missed many of its meetings in London, and he had observed that in practically all the Branches a large number of members made a point of being constant active participants. That was evidence that the organisation had become necessary for the foundry industry. A further proof was the increasing membership. He had also followed the work of the Continental organisations of foundrymen. They were of more recent date than the I.B.F., and they were very active.

Foundry conventions attract a large number of visitors, not only national, but foreign also, and the fact that so many foundrymen go to the expense of travelling across land and sea, and devote several days of their time to these functions is definite proof of the usefulness of the associations and of their meetings.

The first official International Congress was held in Paris in September, 1923. Indirectly, this congress was the outgrowth of the visit to Europe in 1919 of Mr. A. O. Backert, who was then president of the American Foundrymen's Association, followed by the return visits of Mr. Oliver Stubbs, Mr. T. H. Firth and Mr. F. J. Cook, in 1922. In April, 1923, Mr. E. Ramas, president of the Association Technique de Fonderie of France, went to America and presented the invitation to the 1923 International Congress in Paris. On that occasion, about 50 American foundrymen crossed the Atlantic: there were over 80 British delegates, about as many Belgians, and also representatives from Italy, Czecho-Slovakia, Spain, Switzerland, Holland and Scandinavia. The Americans who came over, first visited this country, where they were given an admirable reception. They well remember it, and many of them whom he met in America last October told him that they kept a delightful recollection of their visit to Great Britain.

The second official International Foundrymen's Convention and Exhibition was to be held this year in Detroit, U.S., from September 27 to October 1, inclusive, under the auspices of the American Foundrymen's Association, who had sent out the following invitation to the Institute of British Foundrymen and to the other similar European organisations:—

To the OFFICERS AND MEMBERS OF THE INSTITUTE OF BRITISH FOUNDRYMEN.

Greeting:

The Directors and Members of the American Foundrymen's Association take great pleasure in extending you a hearty invitation to attend an International Foundrymen's Congress and Exhibition in the United States, at Detroit, September 27 to October 1, 1926.

This invitation is the result of unanimous action by the American Foundrymen's Association expressed by a resolution at the Annual Convention in Milwaukee during the week of October 13, 1924.

Full appreciation of the courtesies extended, entertainment, and opportunities afforded for technical investigations to the delegation from the American Foundrymen's Association during their visit in the summer of 1923, was the keynote of the resolution.

It is the desire of the members of our Association that they be accorded the privilege of reciprocating in a measure the generous and whole-hearted hospitality of our European hosts of 1923.

That the "Entente Cordiale" now established between the foundrymen on both sides of the Atlantic be stimulated and perpetuated is our sincerest wish.

We hope you will make arrangements for all your officers and a large number of your members to be with us in 1926.

For the American Foundrymen's Association.

L. W. OLSON, President.
A. B. ROOT, JR., Vice-President.
C. E. HOYT, Secretary.

American foundrymen were desirous that a large and representative British delegation should attend. They had always shown great interest in the activities of foreign associations and more particularly of the Institute of British Foundrymen, and among the various committees of the American Foundrymen's Association is a permanent Committee on International Relations of which Mr. H. Cole Estep was chairman. It was the American Foundrymen's Association who fostered the annual exchange papers in 1920, by entering into an agreement with the Institute of British Foundrymen to exchange papers each year dealing with important questions of foundry practice. The scheme had met with such success that now papers are being exchanged each year between the American, British, French and Belgian Foundry Associations, and others will follow. Undoubtedly, tangible benefits were obtained by the foundryman from this interchange of information and the broader outlook which he derived from it.

It is confidently hoped that further progress will result from this year's event in Detroit, and it is expected that the gathering will be the largest of its kind in numbers and in the diversity of nations represented. Members had received a circular letter giving the material details of the journey to America and the districts which you will have an opportunity to visit. Already several prominent members of British and Continental Associations had expressed their intention of attending. A comprehensive programme was now being devised by the Programme and Papers Committee of the American Foundrymen's Association and a number of allied organisations in America have been invited to participate. The programme embraces every phase of the foundry industry, from both

the technical and the practical viewpoint. The discussions will be of interest to all foundrymen because of the broad field covered. The technical sessions will include, amongst other subjects: Cast iron, malleable cast iron, steel shop practice, steel metallurgy, brass topics, aluminium and aluminium alloys, a symposium on permanent and long life mould castings, foundry costs, apprentice training, management and personal administration, sand control and refractories.

The Exhibition.

An exhibition of foundry and machine shop equipment and supplies will be held simultaneously with the convention. At this exhibition machinery will be in operation showing actual American methods of production. Arrangements are being made to have the visitors from overseas visit the foundries in the leading centres, including Philadelphia, Buffalo, Cleveland, Pittsburgh, Detroit, and Chicago. During the convention numerous visits will be paid to the principal foundries in Detroit. Detroit, which will be host to the American Foundrymen's Association and to their guests, is situated on the Detroit River, and has ample railway and river facilities It is the fourth city in size in the United States, and is noted for its production of motor cars. About 83 per cent. of all the motor cars built in America are made in and shipped from Detroit and the surrounding district. Detroit has more than a hundred foundries that help to make the foundry and machine-tool industry the second ranking industry in the city. There will be ample facilities to take care of the visitors, and 14,000 hotel rooms are available to the convention committee. The exhibition will be held in three adjoining buildings at the Michigan State fair grounds, which are well adapted for large and numerous exhibits.

About 3,500 visitors were registered at last year's convention at Syracuse. The technical sessions were divided into two groups, as was the case in Glasgow last year. The Paper contributed by the Institute of British Foundrymen was read by Mr. J. E. Fletcher, who crossed to America for the purpose. There were other foreign representatives from Great Britain, Sweden, Switzerland, Germany, and South America. At the exhibition, the number, variety, and importance of the exhibits surpassed all previous displays. Complete installations for the conditioning, conveying, elevating and delivery of sand were working. Examples of sand-blast equipment capable of meeting the requirements of the most extensive foundries were assembled. Many of the moulding-machine manufacturers showed practically complete series of their products, most of them in operation. Iron was melted in an electric furnace and poured into moulds, making castings which were used by a local engine builder. It is confidently expected that this year's exhibition will be still more impressive and of greater interest and usefulness.

America is a large country, with a tremendous capacity of consumption. The output of the Ford factories alone reaches 7,000 cars a day. The National Radiator Company buys 100,000 tons of pig-iron at a time. This means that mass production methods are employed extensively. Foundries with a daily output of 250 tons of castings must have a very complete organisation and many problems, as, for instance, the handling of transportation of sand, moulds, molten metal, castings, etc., receive constant attention. Small details are carefully worked out. In one foundry which the speaker visited when in Cleveland last year, $150,000 (£30,000) was spent in changing the scheme of transportation and handling material. After a few months it was found that this new scheme did not yield the results that were expected. The whole system was scrapped, and replaced partly by the old system modified, and it paid them to do it. The labour question is interesting. Unskilled workmen cleaning castings with pneumatic tools can earn $2 (8s.) an hour. Quite a number of them come to the plant in their own motor car, and parking places with forty or 50 cars belonging to workmen are a feature. Yet production is so great and so organised that, notwithstanding the high wages paid, American motor cars and machinery can be sold cheaper than here with a satisfactory profit. American production methods may not be directly applicable on this side of the water, but many principles and many ideas could be adapted to our conditions, and would result in higher production at lower costs. "This is well worth £200 and six weeks of your time," said Mr. Delport, "apart from the interest of the journey itself."

Ladies were cordially invited, and there will be many social functions organised by local foundry associations, as well as in Detroit, and motor-car trips will be arranged for their entertainment. There will also be a visit to Washington and to the Niagara Falls.

THE ANNUAL DINNER.

Mr. J. Masters also presided at the dinner in the evening. Among the guests were Mr. J. Cameron, National President of the Institute; Mr. Cecil Bentham, Chairman of the North-Western Section of the I.Mech.E.; Mr. R. Onions, President of the Manchester Association of Engineers; Mr. J. Poole, Past-President of the Manchester and District Ironfounders'-Employers' Association; Prof. Thompson, President of the Manchester Metallurgical Society; Mr. V. C. Faulkner, Senior Vice-President I.B.F.; Mr. V. Delport, representing the American Foundrymen's Association; Mr. H. S. Knight (Messrs. R. & J. Dempster, Limited); Mr. J. Haigh (Messrs. E. Green & Son, Limited); Commander Jackson, President Sheffield Branch; Mr. H. Summersgill, President West Riding Branch.

After the toast of "The King" had been given by the CHAIRMAN, and duly honoured, MR. C. BENTHAM proposed the toast of "The Institute of British Foundrymen," coupling with it the name of Mr. Cameron. He said he appreciated the honour of being invited to that gathering, and regarded it as a tribute to the Institution, of which he was a member rather than as a compliment to himself. Mechanical engineers were, indeed, intimately associated with foundrymen, because the success of their work depended largely upon the quality of the castings they received. Conversely, foundrymen were largely indebted to the mechanical engineers whose orders enabled them to attain commercial success. Neither could get on without the other.

The production of good castings was a matter of great importance. The draughtsman could readily correct an oversight in his drawing, a remedy could usually be found for the error of the patternmaker, but if the foundryman went wrong the mistake was irredeemable. The work of the Institute was to assert the importance of the foundry and justify its position.

There were many things to learn, and the Institute was the proper channel for teaching those engaged in the foundry industry, and the engineering world generally, how things should be done. Some years ago he was concerned in the breaking up of a number of castings, 30 or 40 years old, which were extremely tough and difficult to break, so that in the end explosives were resorted to. He asked a Scotch foundryman why they did not now get iron like that. The reply was, "Cold blast." That did not satisfy him. It was up to the foundryman to ensure that the castings produced by the present methods of blast-furnace practice were equal to those produced in the old days. True, in those days, cost mattered little, and it had now become of vital importance, but in thinking about cost they must not lose sight of quality, and there was scope for much investigation. By that he meant real painstaking applied research, not in a haphazard way, but learning all about the subject, and putting it to practical use, so that uniformly good castings might be produced. A number of new processes were in view at the present time, and engineers would certainly be glad to have castings which had the properties of mild steel. He, for one, would be quite prepared to use them in place of the ordinary machine castings.

The foundry was not the cleanest of places. In that respect more might be done to make the conditions a little better for the workmen. Attention should be given to improving the construction of the foundry and the methods of working. Then could anything be done to educate the draughtsmen who were concerned with the designing of

castings? It would be a great step in advance if an interchange of papers and lectures was arranged with the Draughtsmen's Association. He himself started engineering work as a draughtsman, and feeling that he was handicapped by lack of knowledge of the methods of making castings and of their behaviour under different conditions, he took a few courses in ironfounding at the Manchester College of Technology. The knowledge he acquired at that time had been invaluable. But relatively few draughtsmen took the trouble to attend the courses at the College of Technology which were suited for men in their position.

Importance of Junior Sections.

MR. J. CAMERON, J.P. (National President), said it was a pleasure to see so many old friends from other Branches as well as Lancashire. In recent years the Lancashire Branch had taken a very prominent part in the work of the Institute. It had provided notable branch-presidents, and excellent secretaries, and, in the person of Mr. Oliver Stubbs, a President of the Institute who had the distinction of having been elected to that high office a second time. (Applause.) On this occasion it was an additional pleasure to find that the Lancashire Branch had the courtesy and good sense to invite ladies to attend.

Mechanical engineers were good friends of the foundrymen, and with all sincerity he would assure Mr. Bentham that when castings of the best quality were required for a special job, the members of the Institute could supply them of the quality required. Their ability to come up to expectations in that respect was due to the hard work which the Institute had done, the Papers which had been written, the discussions which had taken place, and the keenness of the foundry employees. These things had contributed to the raising of the standard. Thanks to the work of the Institute, and thanks to the work of the Cast-Iron Research Association, good progress had already been made, and greater progress was in prospect; so he was confident that they could meet the requirements of the most exacting mechanical engineer. There were many Associations of employers now in existence, some to deal with prices, some to deal with labour disputes. The Institute stood on a higher plane. It was established on a democratic basis, its membership being open to employer and employee, and its purpose was, first, to impress upon the foundryman that he was engaged in a noble craft, in which he ought to take pride, and secondly, to help him to do his work in a manner worthy of that craft. In the splendid success which had been achieved by its Junior Section, the membership of which was now over 300, the Lancashire Branch had given a lead to the Institute.

Cold blast iron made by the old process possessed qualities which had not been equalled by the more modern and cheaper product of the hot blast. The problem was to give the consumer iron which was cheap and also equal to the old product. The solution could be arrived at by conferring together and putting skill into their methods. When he himself became a member of the Institute, through the pressing persuasion of his old friend Mr. M. Riddell, he realised that as an ironfounder he had been sleeping. On every possible occasion now his advice to foundrymen was not to be afraid to break away from conventions, to try something new. M. Ronceray in France and McLain in America, had broken away from convention and were now in the forefront as leaders of thought in the industry.

A very pleasant feature of the Institute was the international relations with the foundrymen in other countries. It was on the most cordial terms with America, France, Belgium and Czecho-Slovakia, and an invitation had been received to attend the International Convention in America. As President, he was going to put it to the Council that they ought to do everything in their power to take advantage of that invitation. Those who visited America next September would learn a great deal about organisation, mass production, labour-saving apparatus and other things. The Americans appeared to have had a very good time a few years ago when they came to this country; they had not forgotten it, and intended to show their appreciation of it. He was sure there would be a large party of British foundrymen, and they would have a most enjoyable time and a very instructive experience.

Presentation of Diploma to Mr. J. Jowett.

The CHAIRMAN stated that the diploma of the Institute had been awarded to Mr. J. Jowett, of Rochdale, for his Paper on the "Casting of Machine Tools," read before the Burnley Section of the Lancs. Branch. He took the opportunity to express the Branch Council's appreciation of Mr. Jowett's services.

The diploma was presented by Mr. Cameron, who said the diploma was a very happy idea. The number of excellent Papers was now so great that it had become a difficult matter to select the best for publication in the annual volume of the Proceedings. It was even more difficult to choose those of outstanding merit and award diplomas.

Mr. Jowett replied briefly.

American Control of Pig-Iron Market.

MR. O. STUBBS proposed the toast of "Kindred Associations." He said unfortunately many mechanical engineers wanted to buy castings at a ridiculous figure, which would not leave the employer his requisite profit, nor enable him to pay his workpeople the money which the employer would like them to earn. Application was being made to the Department of Industrial and Scientific Research to extend the work of the Cast Iron Research Association for another five years. It was gratifying to learn that the members of this Board had visited Manchester, and were favourably impressed by the work which was being done at the Manchester University by Prof. Thompson and his assistant, Mr. Becker. His own firm had invited Mr. Becker to spend six months in their foundry, so that he might become acquainted with the practical side as well as with what was done at the University, and the invitation had been accepted.

He wished to emphasise what Mr. Cameron had said regarding the interchange of Papers and co-operation, that societies working more or less in the same direction ought to come together. In each session there should be one or more nights when the discussion was thrown open, and members of other societies were invited to attend. The Lancs. Branch had done something in that way already; if the Scottish Branch was excepted he thought they had been almost pioneers in that respect. They must not become parochial. The mechanical engineers could tell the foundrymen a lot that they did not know; he was equally convinced that the foundrymen could teach the mechanical engineers something. It was a privilege to have with them that evening Mr. Bentham, the Chairman of the North-Western Section of the Mechanical Engineers, and Mr. Onions, the President of the Manchester Association of Engineers, and he wanted to tell those gentlemen that the opportunities given of attending the meetings of those bodies and entering into the discussions were very much appreciated

They were also delighted to have with them Mr. V. Delport, representing the American Foundrymen's Association. At the present time some thought was being given to the position that America was taking up with regard to the manufacture and control of pig-iron. Negotiations for an advance in wages had been proceeding on a national basis between the engineering employers and employés, and in the course of those negotiations a statement was put forward by Sir Allan Smith, on behalf of the employers, which caused him concern. It seemed to him attention should be drawn to it, because people in this country must wake up and see that they kept what rightly belonged to them. Sir Allan Smith said this:—

"There is a deliberate attempt to-day by America to control the manufacture of pig-iron in Europe. They have invested to such an extent in German and French pig-iron concerns that they will be able to rig the market against this country and compel us to purchase our pig-iron at the price which America may fix for the sale of pig-iron in Europe."

Then he added:—

"We shall either have to join the Continent in fighting this monopoly or we shall have to join

America and make an arrangement with her against the Continental production of pig-iron, or, on the other hand, we shall have to stand alone and be shot at both by the Continental people and by the American market speculators."

Progress was being made in Britain, and a good deal of it was due to the Institute and the kindred Societies. Magnificent work had been done at the Manchester University, and he would ask Prof. Thompson to suggest that the members of the Lancashire Branch should come along some day and see what was being done.

With regard to the invitation to Detroit, he would content himself with saying that those who went would never regret having become acquainted with American methods of production and organisation and American hospitality. When he and others went over on the last occasion they were given a most cordial welcome. That had been the means of bringing about a spirit of international friendship, evidence of which was seen in other countries, and he hoped it would grow. It was due to the Institution of British Foundrymen.

Scientific Speculation.

PROF. THOMPSON, in replying, said he was in agreement with everything that had been said about the value from every point of view of the interchange of papers and closer co-operation between different societies. At the present time there was an increasing tendency—a pernicious one in his opinion—to work in water-tight compartments, and the breaking down of those water-tight compartments would be to the good of everybody concerned. The Manchester Metallurgical Society would be at all times extremely happy to co-operate with the Institute, and he believed in saying that he was speaking for the other Societies represented on this occasion. He must acknowledge the great debt due to Mr. Stubbs and his firm for the facilities which had been given to Mr. Becker. It showed public spirit of a very high order that a firm should be willing to throw open the whole of its works in order to facilitate research work. Unfortunately there were too few examples of it.

He would be extremely glad to give the members of the Lancashire Branch an opportunity of inspecting the laboratories of which he had charge.

It had often been said that metallurgy was both a science and an art. He believed that was true. Certain branches, such as the treatment of steel, were now on a very definite scientific basis; but foundry work was largely an art. Up to the present it had not been found possible to translate the foundryman's acquired and inherent skill into scientific terms, and the probability was that it would be a long time before it would be otherwise; so much in foundry work at the present time was beyond the range of scientific investigation. On the other hand, there were many aspects of it in regard to which information was available, and he was glad to hear that the Committee of Inspection which was appointed to consider the work of the Cast Iron Research Association was so far satisfied with the work that was being done. It was difficult work, for more reasons than one, and he admired heartily the results which had been obtained.

The tendency to deprecate what might be called scientific speculation was to his mind extremely harmful, but it was found in all circles from the highest to the lowest. In his experience foundrymen had always been extremely keen to get in touch with the scientific side. Anybody who had served on the council of a society interested in metallurgy realised fully that no subject was more likely to draw a good audience than one connected with foundry practice. That, he thought, was a very high compliment to the keenness of the foundry industry to link itself with the scientific side so far as it could do so. Science went hand-in-hand with labour. It had two sides, the experimental which was concerned with collecting data, and the theoretical or speculative side, which was concerned with the consideration of the data and drawing conclusions from them. It was possible to make progress, and appreciable progress, from experiment alone, but it was much easier to make progress if adequate experimentation was allied with proper speculation on the results obtained. The goal would be attained much more quickly. It was often thought, quite erroneously, that scientific work was restricted within the walls of universities and similar institutions or in research laboratories of big firms. But in fact, if anyone would collect data patiently—in the case of the foundryman the results of experience—and then consider logically and carefully the results which had been obtained, he was behaving scientifically.

In the individual himself there was a very beneficial effect of scientific thinking Mr. Cameron had spoken about breaking away from tradition. The ability to break away from tradition was only present in a mind which, at any rate within its own limits, was capable of thinking scientifically. One who was not capable of thinking scientifically was compelled, within his own limits, to follow the line of sterile tradition. Scientific thinking made one disinclined to accept dogmatic statements, and there was in the foundryman the ability to think scientifically and therefore to refuse to accept the dogmatism of tradition.

MR. R. A. MILES (Past-President of the Branch) proposed the toast of "The Visitors." It was replied to by MR. J. POOLE, who said that members must feel great satisfaction with the way in which the Institute was progressing. It was doing more for the industry generally than anything else could do. When men got together and compared notes they brought out suggestions which helped to produce better and cheaper work. By the formation of the Junior Section provision was made for filling the ranks of the Institute, and young fellows who took an interest in their trade and had pride in their craft would be a credit to the industry in times to come.

MR. V. C. FAULKNER also replied.

The toast of "The Lancashire Branch and its President" was proposed by MR. R. ONIONS, who said the Saturday afternoon meetings of the Branch were evidence of the intense interest taken by its members in their craft. The details of membership, income and expenditure told a tale of progress.

THE CHAIRMAN responded. He said he deeply appreciated the assistance that the Council, and especially Mr. Makemson, had given him during his term of office. The members of the Junior Section Council were just as keen, and with the very generous help of one or two members and the continuous efforts of Mr. R. Stubbs, the President, they had made the Junior Section a great success.

East Midlands Branch.

Discussion on Jolt Ramming.*

At a meeting of the East Midland Branch of the Institute of British Foundrymen Mr. A. L. Key read a Paper on "Jolt-Ramming Moulding Practice."* An interesting discussion followed, which was opened by MR. S. H. RUSSELL, who asked if the top box bars followed the shape of the pattern when using the jolt machine as when hand moulding; if so, what type of bar was used? He also asked if Mr. Key had had experience of the sand slinger.

MR. KEY replied that a sand slinger would ram from 5 to 10 cub. ft. per minute, whereas the plain jolt machine would ram from 1 to 500 cub. ft. per min. Some of the machines he had referred to were made of a capacity to deal with 30 tons weight. In the case of the sand slinger, the sand had to be specially prepared and conveyed to the slinger. Moulding box bars should reach to within ¾ or 1 in. of the pattern.

Comparison with Other Systems.

MR. LUCAS said that Mr. Key had referred to a great saving in cost with the jolt-ram over the hand-ram machine. He would like to know if the saving in cost referred to was only in so far as

* This Paper appeared in our issue of March 27, 1924, when was read before the Lancashire Branch.

moulding was concerned. Had Mr. Key taken into consideration the necessary initial expensive air compressor plant, and its by no means light upkeep? Patterns for jolt-ram machines must be made somewhat different from other patterns, and were consequently more expensive, and involved much more coremaking, and he wondered whether Mr. Key had taken this into consideration in arriving at his saving in cost, as not only should the cost of the mould be taken into consideration, but the extra coremaking also. He would like to hear if Mr. Key had had any experience with regard to electric jolt and hand jolt, as compared with pneumatic jolt.

In some foundries hydraulic squeezers had been installed for ramming up big moulds, and again he would like to have a comparison of this method with the pneumatic jolt. He (Mr. Lucas) insisted that in jolt-rammed moulds with vertical sides he had always found the vertical side soft. He would like to hear how Mr. Key would propose to overcome the softness.

With regard to the short fixed pins in the moulding boxes, Mr. Lucas asked if all Mr Key's patterns were fixed on the pattern board, that is, did he have to draw the board as well? If so, how did the moulder get the "feel," as short pins would not help him to get an accurate draw?

MR. KEY, in answer, said that the great saving referred to was the difference between hand-ramming and jolt-ramming methods of producing the casting. Against that the necessary amount of air completely to ram a mould would cost in b.h.p. one-third of a penny, plus the usual oncost charges. The cost for installation, or upkeep of the machine, would vary from one penny and upwards per mould rammed, no matter whether the mould contained 10 or 100 cub. ft. of sand. This cost was controlled by the demand on the machine. The difference in the construction of patterns for jolting, as against patterns moulded by other methods, varied to a very small degree. Regarding the extra cost of coremaking, this item had in many instances been considerably reduced, for whereas upon first acquaintance of a drawing, when setting out to build a new pattern, experience had taught that whereas in the past it had been considered necessary to core out overhanging parts, this cost could now be obviated by a more or less pre- or post-ramming by hand.

With regard to electric jolt machines, he had had the privilege of seeing some of these machines at work, although the jobs were not of the large type. The machine appeared to do its work satisfactorily, although the extent of their capacity, and adaptability, did not appear to compare favourably with the pneumatic machine.

The hand-jolt machine appears to be a very useful machine within certain limits, especially where small boxes are concerned. When larger boxes are used, the human fatigue appears considerably heavier than hand-ramming. Hydraulic machines will do some very useful work, but these machines are usually confined to special sizes of boxes for each machine.

The trouble with soft ramming on the vertical sides of moulds had not so far been experienced by him. In exceptional cases it was sometimes necessary to pre-ram the sides first, i.e., to fill the box just above the sides of the pattern, and then give a few jolts; after that complete the filling of the box, and continue the jolting until the necessary number of jolts had been given. If the sand was too wet it would cause the softness spoken of, and again an insufficient number of jolts, or too many jolts, might cause the same trouble.

Moulding-box Pins.

Short fixed pins were used for registering purposes only, and were usually fixed at opposite corners of the box. Longer loose pins were used in cases where the patterns were drawn from the mould, whilst fastened to the pattern plate. A simple portable mechanical contrivance was used to perform this operation. In the case of very deep patterns the pattern plate was removed first, and the pattern drawn in the ordinary way.

MR. ROWELL asked what kind of bars were used in the bottom parts.

MR. KEY replied that the design of bars used was dependent on the size of the box. For medium size boxes vertical shallow bars with a rib on either side were used, as is shown in Fig. A. For larger boxes, where it was necessary to have a drag

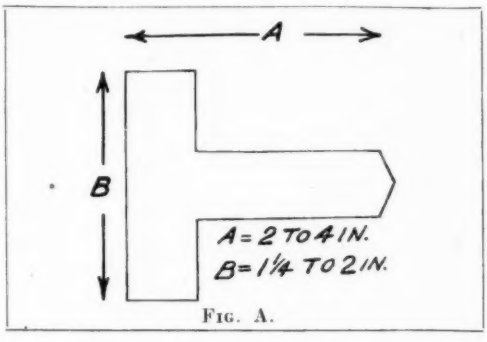

FIG. A.

part, bars similar to an ordinary top part were used. In connection with most of the larger sizes of boxes it had been found a great advantage to use drag plates.

Sand Conveying to Machine.

MR. DRIVER asked if any arrangement had been made for conveying the sand to the machine. Would it not be possible to have some method of conveying the sand to the machine whilst it was being jolted?

The LECTURER replied that in a number of cases it would be advantageous to convey the sand to the machine. The practice at the lecturer's works was as follows:—The boxes were filled away from the machine, then taken to the machine by the crane and jolted, which was only a minute's operation, and taken away on the floor. By this means any number of men could be employed in preparing boxes in various parts of the shop ready for the crane to lift them to the machine for jolting. By this method the machine could be used to its full capacity, for if the boxes were filled on the machine the capacity of the machine would be considerably reduced.

Judging Sand Requirements.

MR. STEVENSON inquired how much extra allowance should be made at the top in the ramming up of deep moulds.

MR. KEY said that the sand was piled above the edge of the box to the centre, at an angle varying from 30 deg. to 60 deg.; this was found to be sufficient. The actual amount of extra sand required for ramming down was controlled by the shape of the pattern, and also to its relative size as compared to the cubic capacity and depth of the moulding box. In the case of repetition work, once this had been determined a wooden frame could be used on the box. The depth of this frame could then be made so as to hold just sufficient sand to allow the box to be full after jolting.

MR. GRANT said he would like to hear if Mr. Key's experience had been that the sand split away from the gagger.

MR. KEY insisted that if gaggers were placed as near vertically as possible, they would flow down along with the sand whilst jolting was taking place. Sand splitting away from the gagger was a very rare occurrence, and when this did happen it could invariably be traced to faulty gaggering. Gaggers should not be hung on the box bars.

MR. ROWELL had noticed that Mr. Key referred to 40 to 90 jolts, and he would like to know if the speed of the jolt was altered at all.

MR. KEY answered that for deep boxes the best speed had proved to be sixty jolts per minute. For shallow boxes the quicker speed gave quite satisfactory results. Generally speaking, the speed was not so important as the necessary number of jolts required, as either under or over within reasonable limits would result in softness or hardness. Both were faults which had caused so many failures, especially in ramming top parts, which had a more or less flat surface.

XUM

Foremen: Good and Bad.

BY J. M.

It is often assumed that the good foreman, from the employer's point of view, must be a bad foreman from the workman's. We have heard many discussions as to what is the best training for a foundry or a patternshop foreman, and it is almost correct to say that no training will make a foreman. Leadership is, more or less, a gift, and the successful foreman is a born leader. He is a man with a stronger personality than those subordinate to him, and there are qualities, such as tact, that are even more important than skill in craftsmanship.

It was said recently that the leader is always at the head of his men, while the driver, of necessity, must remain in the rear. This is a half truth, because sometimes the driver is a born leader. There does not appear to be any real reason for troubling about foremen; if we have a correct system of apprenticeship and suitable men are in a trade they will train themselves. Let us consider briefly those qualities that the aspirant to a foreman's position should develop.

We know of one foundry foreman to-day who cannot read or write, but this type is dying out, as is also the bullying type. One of the chief qualifications of a foreman, whether of a large or small shop, is the ability to organise. There are splendid fellows, honest and clever, who fail hopelessly because they cannot organise. The organiser does not need to force discipline, at least not consciously, because his methods result in a system of discipline. The organiser should make the production machine as a whole work so smoothly that there is no need to hustle men; indeed, everybody ought to have a comfortable time.

The foreman who is not a clever craftsman is at a disadvantage, and especially is this so in a small foundry. We have known a foundry foreman, in a shop where much loam work was done, who had no practical knowledge of loam work. There is a certain school who think that theoretical knowledge is the prime essential, but a man may be a clever metallurgist yet an indifferent foundryman or leader. In a large shop divided into several departments the inferior craftsman is not at such a disadvantage, because his heads of departments are responsible for the practical work, but there can be no gainsaying the fact that the man who cannot, in emergency, get his coat off and do a job is at a disadvantage. A head foreman entrenches himself firmly as a leader when, on the occasion of a big difficulty presenting itself, can step in and effect a solution when his subordinates are beaten.

Some foremen become so by accident, either through long service or being the first man started by a new firm. These are generally the least efficient foremen, and the most efficient is the man who is training himself for the position from the day he starts his apprenticeship. The faculty of handling men successfully is assisted greatly if the power of close observation is cultivated, and this can be cultivated by everyone. Much that is objectionable goes on in some shops because the foreman does not see. It is advisable at times not to see, but well that men should understand that the blindness is self-willed.

It is unfortunate that the most suitable men are not always chosen to be foremen. The man with the technical qualifications and practical experience, plus personality, may be passed by for a much inferior man who has well-placed friends. The writer has seen this occur over and over again, and, not long since, an instance came to his notice of a foreman who was "found out" by a new proprietor, but who almost immediately secured another position; his chief qualification was that he had been an unsuccessful foreman previously! Employers would often do better to exercise independent judgment in promoting men without regard to previous positions held by them. It is all to the good that the tendency to-day is to consider young men when appointing foremen, because age does not always mean experience.

ALUMINA METALS, LIMITED, are being wound up voluntarily, with Mr. W. Abbott, 80a, Coleman Street, London, as liquidator.

The Technical Exhibit at the Foundry Exhibition.

In connection with the forthcoming Foundry Exhibition, to be held in conjunction with the Annual Conference of the Institute of British Foundrymen, the organisers, Messrs. F. W. Bridges and Sons, Limited, have placed at the disposal of the Technical Advisory Committee, a large space. This Committee, which is presided over by Mr. Wesley Lambert, has prepared a schedule of exhibits which is reproduced below.

Schedule of Proposed Exhibits.

Metallography and Microscopical Examination.—(1) Complete metallographic apparatus to be used for demonstration purposes. (2) Metallurgical microscopes with illuminating device for use on exhibition stand. (3) Stereoscopic microscopes with illuminating device, for use on exhibition stand. Prepared specimens for use with (1) and (2), accompanied with separate photographs (interpreted). Fractured specimens, numbered, for use with (3), accompanied with index giving particulars.

X-Ray Examination of Metals.—Complete X-ray apparatus available for demonstrations at the exhibition.

Measuring Apparatus.—Various types of pyrometers suitable for foundry use. Laboratory apparatus used for determining:—(1) Melting and freezing points; (2) heating and cooling curves; and (3) volume change—liquid to solid.

Testing Machines.—Impact machines of various types; repeated bending machines of various types; hardness testing machines of various types; small machines other than the above likely to be of interest.

Laboratory Apparatus.—Apparatus used in the examination of foundry sands, fuel, refractories, analysis of metals.

Metal Exhibits.—Interesting exhibits of foundry failures, freaks and happenings; fractures of irons and non-ferrous metals, with analysis; collection of ferro alloys; samples of cathode copper, etc.; antiques; examples of corrosion of cast metal.

Patterns and Castings.—An example of a casting (with heads, risers and runners), such as internal-combustion engine casting; pattern for same and core-boxes; monoblock engine casting for automobile (unfettled); pattern for same and core-boxes.

Wall Exhibits.—Charts; diagrams, photographs; curves, pictures, etc., relating to metals, foundry plant, ancient and modern, castings, foundry layouts; organisation; costing; processes; casting defects; blast furnaces; cupolas; regenerative melting furnaces, stoves, coke ovens, mills, etc.

Specifications.—Collection of specifications of foundry requisites and products available for reference: B.C.I.R.A., A.S.T.M., B.E.S.A., etc.

The Committee requests the co-operation of the entire foundry industry and any firm or individual who can loan apparatus, specimens, or samples, should communicate with the honorary secretary, Mr. K. W. Bridges, Avenue Chambers, Vernon Place, Southampton Row, London, W.C.2. It should be clearly understood that the exhibit is essentially non-commercial, and, as will be seen from the schedule, it is designed with the object of permitting the lesser scientific members of the industry to handle and examine the apparatus and material from which the trade's technical structure is built. Further, it is hoped that the exhibit will show something of the history of the industry and provide pointers for its future development. The Committee is fortunate in having the close co-operation of Dr. W. Rosenhain, F.R.S. (National Physical Laboratory); Professor Turner (Birmingham University); Dr. Hutton (Non-Ferrous Research Association); Mr. J. G. Pearce (British Cast-Iron Research Association); and a number of members of the London Branch of the Institute of British Foundrymen and delegates from the Foundry Supplies and Equipment Association.

THE FIRST OF A SERIES OF LECTURES on "Fire Clay Refractories," arranged by the Department of Metallurgy of the Birmingham University, was delivered on February 4 by Mr. C. E. Moore.

HEARD IN THE TRAIN

WORKSOP TO SHEFFIELD

FIRST TRAVELLER (PIG-IRON MAN), (*Reading "Foundry Trade Journal"*) : **Hello ! Grays are advertising again. Thought they'd gone West.**

SECOND DITTO (GANISTER MAN), (*In general refractory mood*) : **Wish they jolly well had. Their rotten Silacene's doing me no good.** (*Violently rustles newspaper.*)

THIRD DITTO (COKE MAN): Nor me. One of my largest consumers has reduced his order by nearly 25 per cent. since those blighters Silacened his Cupolas.

FOURTH DITTO (LIMESTONE MAN) : That's nothing. This Silacene has cut some of MY orders by over 50 per cent.

PIG-IRON MAN TO GANISTER MAN : And how does Silacene affect you ?

GANISTER MAN : How does it affect me ? Only lost nearly all my best customers and never know from day to day whom I'm going to lose next.

PIG-IRON MAN : That's a rotten position to be in, but there must be a remedy. Anything wrong with your stuff ?

GANISTER MAN : No, it's been the same for the past thirty years, and what was good enough then should be good enough now.

PIG-IRON MAN : That's where you're wrong, my friend. If you are to compete to-day you must move with the times.

GANISTER MAN : As a matter of fact, I might tell you in confidence one or two of us are trying to copy this Silacene. We've got the colour all right, but we can't get the quality.

JIM (*who has remained silent hitherto*) : SO NOW WE KNOW. **You must be the bloke wot told our Boss you 'ad somethink as good as Silacene at 'arf the price—let me down proper it did and didn't 'arf cost us a pretty penny neither. Just wait till the Boss sees yer, that's all, ye're for it an' no errer.**

Train stops, Jim gets out. Pig-Iron man doubled up with laughter. Ganister man speechless. Coke and Limestone men start earnest conversation.

THOMAS E. GRAY & CO., LTD.

The Makers of "SILACENE"

119, HIGH HOLBORN, LONDON, W.C.1

— ESTABLISHED 1877 —

Trade Talk.

SMITH'S DOCK COMPANY, LIMITED, have booked orders for two large cargo steamers to be built at their Southbank shipyard, near Middlesbrough.

A LECTURE ENTITLED "Engineering Developments in Connection with High-Speed Machinery" was given to the members of the Sheffield Metallurgical Association last week by Mr. R. W. Bailey.

THE MIDLAND IRON AND STEEL WAGES BOARD ascertainment for November and December shows a drop in the average selling prices of 6s. per ton, making a total reduction since the corresponding period of last year of 24s. 6d.

THE SIEMENS AND GENERAL ELECTRIC RAILWAY SIGNAL COMPANY, LIMITED, which has just been formed, is a fusion of the railway signalling departments of Siemens Brothers & Company, Limited, and the General Electric Company, Limited.

RECENTLY ANOTHER blast furnace at the Normanby Ironworks was restarted. Last week, it is stated, another was to be lighted at Bolckow, Vaughan & Company's South Bank plant, and other Cleveland firms are also contemplating starting additional plant.

THE COMMONWEALTH AND DOMINION LINE has placed orders for two twin-screw motor vessels with Swan, Hunter & Wigham-Richardson, Limited, one to be engined by William Doxford & Sons, Sunderland, and the other by the Wallsend Slipway and Engineering Company.

KING, TAUDEVIN & GREGSON, LIMITED, Cambridge Street, Sheffield, have acquired the business of Hinchliffe Brothers & Company, Townhall Chambers, Sheffield, who for many years have enjoyed a high reputation for the quality of fluor spar they have marketed.

MR. J. MCGOVERN, the managing director of the Furness Shipbuilding Company, Limited, Haverton Hill, has returned to this country from New York. He has secured an order for two motor liners from the Grace Line, of New York. The vessels will have a gross tonnage of 10,600 tons, and be propelled by twin screws, driven by Sulzer Diesel engines of 10,000 i.h.p.

IN A LECTURE at Scunthorpe to the Lincolnshire Iron and Steel Institute, Mr. F. W. Harbord (vice-president of the Iron and Steel Institute) dealt with the subject of economy and efficiency in the iron and steel industry. He stated that in order to continue to hold our own in competition with markets abroad, we would have to reduce the cost of production of pig-iron and steel still further, not by reducing wages at all, but by exercising more rigid economies in fuel combustion, and in the utilisation of waste heat and by-products. Furthermore, we would have to increase the output per man by means of more efficient machinery. He referred to the mechanical diggers operating in the Frodingham ironstone mines, and said that if it had not been for the introduction of these machines for the purpose of dealing with the large quantities of material which now that the mines were running deeper, had to be removed, hardly a single blast furnace would be working in North Lincolnshire, as it would not pay to raise the ironstone manually.

THE SHAREHOLDERS of Siemens Brothers & Company, Limited, have approved the following resolution, viz.: "That the 10 per cent. cumulative preference shares of £1 each be limited to the 550,000 of such shares now issued and fully paid, and that the 450,000 10 per cent. cumulative preference shares of £1 each now remaining unissued shall be and become part of the ordinary share capital and that the share capital of the company be increased to £3,000,000 by the creation of 500,000 ordinary shares of £1 each, so that thereafter the capital of the company will be £3,000,000, divided into 550,000 10 per cent. cumulative preference shares of £1 each, all of which have been issued and are fully paid, and 2,450,000 ordinary shares of £1 each, of which 1,500,000 ordinary shares have been issued and are fully paid, and the remaining 950,000 ordinary shares are unissued." Mr. G. Mure Ritchie (chairman of the company), who presided at the meeting remarked that during the last three years they had been making important extensions of the factories at Woolwich, involving a total expenditure of about £600,000. It was supposed that in respect of these extensions the greater part would be available for active operations before 1926, but, owing to adverse weather conditions and other circumstances beyond their control, the completion of that programme had not yet been reached, though the remaining works were now in a fairly forward state. The order book was larger than it had been for years; they had brought into 1926 a substantially larger volume of unfulfilled contracts than was carried forward from 1924 to 1925. The new shares would be offered to the ordinary shareholders in the proportion of one new share for every three ordinary shares held.

Company Reports.

Scottish Iron and Steel Company, Limited.—Ordinary dividend, 5 per cent. for year 1925.

National Gas Engine Company, Limited.—Dividend, 4 per cent. (actual) for year on ordinary, less tax.

Dalmellington Iron Company, Limited.—Interim dividend, 6d. per share, free of tax, on ordinary shares.

Steel Developments, Limited.—Profit, £5,107; balance forward, £2,692; total, £7,799; interim dividend, 3 per cent. free of tax, £2,246; available balance, £5,552; final dividend, 3 per cent. free of tax, £2,246; balance forward, £3,006.

Lion Foundry Company, Limited.—Credit of profit and loss account, £17,494; dividends for year, eight per cent. per annum on preference shares, ten per cent. per annum on ordinary shares, and corresponding percentage on deferred shares, together with bonus of ten per cent. on each class, all less tax, £5,451; carried forward, £12,043.

Personal.

MR. J. J. LASSEN has retired from the board of directors of James Gordon & Company, Limited, engineers, Windsor House, Kingsway, W.C.2.

MR. E. J. WHITSON has been elected a director of the Lion Foundry Company, Limited, in succession to the late Mr. G. C. Whitson.

SIR ROBERT ABBOTT HADFIELD, BART., has received His Majesty's Royal licence and authority to wear the insignia of Officer of the Legion of Honour, conferred upon him by the President of the French Republic in recognition of valuable services.

MR. C. A. PARSON and Mr. C. C. Parson, late directors of William Jacks & Company, Limited, have, in conjunction with Mr. W. H. Crosland, formed a private limited company under the style of Parson & Crosland, Limited, with a capital of £65,000, £50,000 of which is issued and fully paid up. The company will carry on business as iron and steel merchants and agents.

Wills.

SUMMERS, F. B., director of John Summers & Sons	£205,801
HUNT, J. W., late chairman of the Chillington Tool Company, Limited, Chillington Works, Wolverhampton	£9,731

Contracts Open.

Birmingham, February 26.—Sluice valves and ironwork, for the Water Committee. The Secretary of the Water Department, Council House, Birmingham. (Fee, £1 1s., returnable.)

Colchester, February 20.—About 280 tons of 6-in., 5-in., 4-in. and 3-in. cast-iron pipes, specials, valves and fittings, for the Lexden and Winstree R.D.C. Messrs. Sands & Walker, Milton Chambers, Nottingham. (Fee, £2 2s. (by cheque), returnable.)

Johannesburg, March 18.—One 7-ton electrically-driven portal crane complete and five 4-ton electrically-driven portal cranes complete, for the South African Railways and Harbours. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Ref. A.X. 2796.)

London, S.E., February 23.—Materials, for the Director-General, India Store Department, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

Manchester, February 23.—Steelwork at the permanent way and parcels depôt, Bennett Street, Hyde Road, for the Tramways Committee. The City Architect, Town Hall. (Fee, £1 1s., returnable.)

Otago, N.Z., March 26.—One steam or I.C. air compressor, one 10-ton steam self-propelling crane, one 3-ton steam self-propelling crane, one steam locomotive, one steam shovel, and 20 10-ton side-tipping wagons, for the Otago Harbour Board. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Ref. A.X. 2782.)

Richmond, Surrey, February 22.—Pump, etc., for the Water Committee. Mr. H. P. Williamson, water engineer, Riverside, Richmond, Surrey. (Fee, £1, returnable.)

Santiago, April 30.—Iron and steel wires, for the Chilean State Railway Authorities. The Department of Overseas Trade. (Ref. C. 1882.)

Sourabaya, March 27.—Straight socket pipes and specials; sluice valves and safety valves; galvanised steel pipes, pig lead (pigs 50 kilogs); jute packing; for the Burgomaster at Sourabaya. The Department of Overseas Trade, 35, Old Queen Street, S.W.1, quoting reference A.X. 2826.

Telegrams: "THROWER, GLASGOW." Telephone: 5909 CENTRAL.

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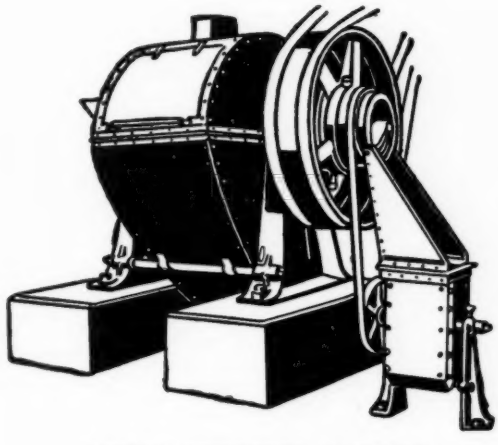

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If you don't want to lose what your Competitor is saving, you must write to us about it now.

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Special "G" Quality Cupola Bricks

Works: HOMER HILL, BRETTELL LANE, TINTAM ABBEY, CROWN, DELPH.

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Blast Furnace Linings and Stove Bricks

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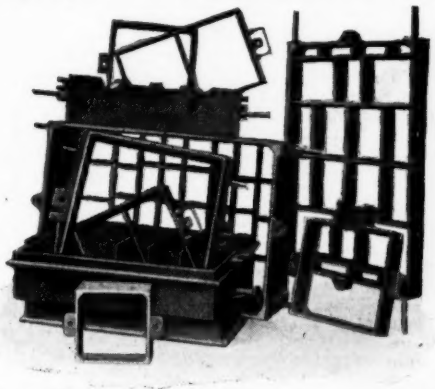

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THE GREATEST ACCURACY

Our Foundry and Special Finishing Plant turn out large quantities of these boxes every day.

Let us quote for your next job.

We can save you money.

The Foundry and Engineering Co.

Albion Road, WEST BROMWICH.

IRON AND STEEL MARKETS.

Pig-Iron.

MIDDLESBROUGH.—Following the activity prevailing in the Cleveland iron market during the past weeks, business has now assumed a steadier tendency, most of the more important buying having been completed to satisfy first-quarter requirements, which are about equal, at the moment, to furnace output capacity, the present export outlook not warranting any increase in production. At the present price of No. 3 there is but little inducement to import Continental iron into this country, but any further advance would evidently revive this business. At last week's market there was not a large attendance, but quotations were firmly held at last week's levels. No. 1 was 73s., No. 3 G.M.B. 70s. 6d., No. 4 foundry 69s. 6d., and No. 4 forge 68s. 6d. per ton. These are for export f.o.b., home prices are 6d. per ton less.

The hematite market on Tees-side remains practically unchanged, with supplies only procurable on a sort of hand-to-mouth basis. There is a steady home demand, but the rather better inquiry from abroad seems to have reached its limits for the time being. Current quotations represent a further stiffening of prices during the past week, East Coast mixed numbers now being 78s. per ton, and No. 1 78s. 6d. On the West Coast, prices are maintained, with Bessemer mixed numbers £4 2s. 6d., c.i.f. Welsh ports; £4 7s. per ton, delivered at Glasgow; £4 10s. per ton, delivered at Sheffield; and £4 14s. 6d. per ton, delivered at Birmingham.

THE MIDLANDS.—Business in foundry pig-iron in this district has, to some extent, tapered off during the past fortnight, the bulk of recent booking having been for forward delivery. Furnaces report that deliveries against contract bookings are being taken up at a very good rate, and it would appear that most of the iron now being produced is going direct to the consumer, and very little into stock. Ruling prices are as follow :—Derbyshire No. 3 foundry, 67s. 6d. to 68s. 6d.; Staffordshire No. 3 foundry, 67s. 6d. to 68s. 6d.; Northants, No. 3 foundry, 64s. to 65s.

SCOTLAND.—The market for Scotch foundry iron continues quiet, with consumption now reduced to very moderate proportions, the foundries only buying in quantities sufficient for immediate requirements. Prices, however, are steadily maintained on the basis of 76s. 6d. for No. 3 grade. Continental iron can still be bought at about 69s. per ton at Grangemouth, but here, also, there is not much inquiry as founders are fairly well provided for, and not inclined to increase their commitments in the meantime.

Finished Iron.

It is satisfactory to report in one section of the trade at least, some slight improvement in demand for crown bars, but, so far, insufficient in volume to keep the works even moderately engaged, and the mills are only fitfully employed. The price for this class of iron varies from £11 to £11 10s., the lower figure coming from the Lancashire works, although Derbyshire are following very closely at £11 5s. To get their share of what business there is available the local works will have to meet this competition. There is no alteration in the price for nut and bolt and fencing irons, which are offered at between £10 5s and £10 10s.

Steel.

The volume of inquiry for steel and its various products continues far from satisfactory, although certain sections of the industry are more active than others, the general conditions are below expectations current earlier in the year. In semi-products, makers engaged largely on the production of sheet and tinplate bars continue moderately busy, notwithstanding the large quantities of foreign bars imported at the ports. Makers' prices show no change, and supplies are offered at £6 2s. 6d. to £6 5s. The demand for soft steel billets is not good, and in the case of Wales the makers in many cases are not rolling. Makers of tinplates are hopeful that now the pooling arrangement is in operation the market will improve. Meanwhile, works are holding out for higher figures, though business has been done under 19s. 6d. basis I.C., f.o.b. works port.

Scrap.

Very little improvement can be noted in the general conditions of the scrap metal markets, which are everywhere inclined to dulness, with demand reduced to almost insignificant proportions. In Scotland, as a typical example, there is only a limited business passing, with machinery cast-iron scrap still a little easy, although odd parcels have changed hands at 74s. to 74s. 6d. per ton, and for ordinary cast, suitable for foundries, and to the same specification 68s. 6d. per ton. Old cast-iron railway chairs have been disposed of at 73s. 6d. to 74s. 6d. per ton, and for light cast iron and firebars the price still remains at 60s. per ton. The latter are not offering any more than 67s. 6d. per ton, for business in this line is very quiet.

Metals.

Copper.—After a brief period of reaction recently values in the standard copper market have again recovered to what may now be termed a fairly normal level, within, say, a range of about the £60 quotation. That this movement is justified by the position of the metal may be assumed from the fact that considering that the world consumption of copper in the past year was a record, and that the American refinery stocks during 1925 were reduced to much under the normal, other metals standing at a rather inflated level, the lack of resistance to the spasm of weakness has aroused some little surprise. The fact also that buying in America has been on a fairly large scale has been completely ignored, and although the belief exists in not a few quarters that the fall has been overdone, it is too much to say that an upward reaction is inevitable. Current quotations :—*Cash* : Thursday, £60 2s. 6d.; Friday, £60 10s.; Monday, £60 7s. 6d.; Tuesday, £59 17s. 6d.; Wednesday, £59 15s.

Three Months : Thursday, £61 2s. 6d.; Friday, £61 10s.; Monday, £61 7s. 6d.; Tuesday, £60 17s. 6d.; Wednesday, £60 15s.

Tin. — Though a steady tendency in tin values is generally experienced, forward selling at times has been temporarily counteracted by some buying of near metal, but free offers of the latter subsequently made their appearance, so that the premium on cash and near tin was gradually reduced to £3 15s. a ton. This feature deserves particular notice considering that only a slight addition was made to the home stocks. Current quotations :—*Cash* : Thursday, £287 10s.; Friday, £286 10s.; Monday, £288; Tuesday, £287 15s.; Wednesday, £288.

Three Months : Thursday, £281; Friday, £280 2s. 6d.; Monday, £281 7s. 6d.; Tuesday, £280 10s.; Wednesday, £280 10s.

Spelter.—The general position of the market is not so strong as it has been. Galvanising business has fallen off, and with Germany exporting an increasing quantity no great improvement can be foreshadowed. Now that the backwardation has so largely run off, this strengthening and somewhat artificial feature has been removed. Current quotations :—*Ordinary* : Thursday, £35 5s.; Friday, £35 17s. 6d.; Monday, £36 1s. 3d.; Tuesday, £35 16s. 3d.; Wednesday, £35 11s. 3d.

Lead.—The market for soft foreign lead continues comparatively quiet, with prices still inclined to lower levels, the closing quotation last Thursday being about 11s. down on the week. Consumptive demand at this season, however, may be expected to recover at an early date, and as the statistical position is relatively sound, firmer values may be reasonably anticipated in the near future. Current quotations :—*Soft foreign (prompt)* : Thursday, £35; Friday, £35 10s.; Monday, £35 10s.; Tuesday, £34; Wednesday, £34 1s. 3d.

Accidents Interrupt Production !

Foundry Workers should be equipped with Asbestos Reinforced Protective Garments, Safety Goggles, etc., as supplied to H.M. Govt., the leading Iron, Steel & Gas Works.

Write for full particulars of a wide range of equipment including

Gaiters, Gloves, Arm Guards, Aprons, etc. Also Protective Safety Goggles, Smelters' Spectacles, Sand Blast Helmets, Face and Hand Shields, etc.

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Telegrams: "Norswedan, Barb, London." *Telephone*: Clerkenwell 2869.

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Having now completed the extensions of our Ganister Pits, which are now equipped with the most modern grinding and pugging plant, we now offer SILCRETE GANISTER in a very improved form for the Lining of CUPOLAS, STEEL CONVERTERS, LADLES, PIT FIRES, BRICKING, etc.

The cost is about one half of the Price of Sheffield Ganister and all Patent Linings.

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(Registered).

(*THE REFRACTORY OF STANDING*)

(*TESTIMONIALS*)

"Our Foreman states that during his experience, that dates back some 48 years, that he has not found cupolas to stand up so well as when using your Ganister."

Originals can be seen!

"We have tested the Ganister you sent us and find it in every way satisfactory. You need not hesitate to sell SILCRETE with confidence. Bring any of your customers to look at our lining if they need any convincing."

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COPPER.

	£	s.	d.
Standard cash ..	59	15	0
Three months ..	60	15	0
Electrolytic	66	10	0
Tough	63	0	0
Best selected ..	63	15	0
Sheets	90	0	0
India	75	0	0
Wire bars	67	0	0
Do. March	66	10	0
Do. April	66	10	0
Ingot bars	66	10	0
H.C. wire rods ..	70	15	0
Off. av. cash, Jan.	59	1	6
Do., 3 mths. Jan.	60	3	0
Do., Sttlmnt, Jan.	59	1	7½
Do., Electro, Jan.	65	11	4½
Do., B.S., Jan. ..	63	16	10½
Aver. spot price copper, Jan. ..	59	1	6
Do., wire bars, Jan.	65	16	3
Solid drawn tubes			13d.
Brazed tubes ..			13d.
Wire			10d.

BRASS.

Solid drawn tubes ..	12d.
Brazed tubes	13½d.
Rods, drawn	11½d.
Rods, extd. or rlld. ..	7½d.
Sheets to 10 w.g ..	10⅞d.
Wire	10½d.
Rolled metal	9¼d.
Yellow metal rods ..	7½d.
Do. 4 × 4 Squares	8d.
Do. 4 × 3 Sheets ..	8½d.

TIN.

	£	s.	d.
Standard cash ..	288	0	0
Three months ..	280	10	0
English	286	0	0
Bars	288	10	0
Straits	289	15	0
Australian	288	10	0
Eastern	287	10	0
Banca	288	10	0
Off.aver. cash, Jan.	282	3	3
Do., 3 mths.,Jan.	276	4	4½
Do., Sttlmt. Jan.	282	3	0
Aver. spot., Jan.	282	3	0

SPELTER.

	£	s.	d.
Ordinary	35	11	3
Remelted	35	10	0
Hard	30	0	0
Electro 99.9 ..	39	0	0
English	36	10	0
India	32	0	0
Zinc dust	45	0	0
Zinc ashes	15	10	0
Off. aver., Jan. ..	37	14	2½
Aver., spot, Jan.	38	1	2½

LEAD.

	£	s.	d.
Soft foreign ppt.	34	1	3
English	35	10	0
Off. average, Jan.	34	13	7½
Average spot, Jan.	34	15	6¾

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	45	0	0
Do. V.M. ex whf.	42	0	0
Rods	49	0	0
Boiler plates ..	42	10	0
Battery plates ..	43	0	0

ANTIMONY.

	£	s.	d.
Special brands, Eng.	99	0	0
Chinese	92	0	0
Crude	61	0	0

QUICKSILVER.

	£	s.	d.
Quicksilver ..	14	15	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon	
25%	9 17 6
45/50%	11 16 6
75%	21 2 6
Ferro-vanadium—	
35/40% 14/- to 15/-	lb. va.
Ferro-molybdenum—	
70/75% c. free	6/- lb.
Ferro-titanium—	
23/25% carbonless	1/- lb.
Ferro-phosphorus, 20/25%,	£19 10 0
Ferro-tungsten—	
80/85%,c.fr. 1/10 to 1/11	lb.
Tungsten metal powder—	
98/99% .. ..2/1 to 2/2	lb.
Ferro-chrome—	
2/4% car. ..	£33 0 0
4/6% car. ..	£22 0 0
6/8% car. ..	£21 17 6
8/10% car. ..	£20 17 6
Ferro-chrome—	
Max. 2% car.	£39 15 0
Max. 1% car.	£45 0 0
Max.0.70%car.	£50 0 0
70%, carbonless	1/5½ lb.
Nickel—99%,	
cubes or pellets £172 to £175	
Cobalt metal—98/99%	10/- to 11/- lb.
Aluminium 98/99%	£118
Metallic Chromium—	
96/98% ..	3/9 lb.
Ferro-manganese (net)—	
76/80%, loose	£15 7 6
76/80%, packed	£16 7 6
76/80%, export	£15 5 0
Metallic manganese—	
94/96%, carbonless	2/- lb.
Per ton unless otherwise stated.	

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten ..	s. d. 2 6
Finished bars, 18% tungsten ..	3 0
Per lb. net, d/d buyers' works.	
Extras—	
Rounds and squares 3 in. and over ..	4d.lb.
Rounds and squares under ½ in. to ¼ in.	3d. lb.
Do. under ¼in. to ⅛ in.	1/- lb.
Flats, ½in. × ½in. to under 1 in. × ⅜ in.	3d. lb.
Do. under ½in. × ½in.	1/- lb
Bevels of approved sizes and sections	6d. lb.
Bars cut to length	10% extra
Scrap from high-speed tool steel—	
Scrap pieces	3d.
Turnings and swarf	1d.
Per lb. net, d/s steel makers' work	

SCRAP.

	£	s.	d.	£	s.	d.
South Wales—						
Hvy. steel	3	7	6 to	3	8	6
Bundled steel & shrngs.	3	2	6 to	3	7	6
Mixed iron & steel	3	1	6 to	3	3	6
Heavy cast iron	3	2	6 to	3	6	0
Good machinery for foundries ..	3	7	6			
Cleveland—						
Heavy steel ..	3	5	0			
Steel turnings ..	2	5	6			
Cast iron borings	2	5	0			
Heavy forge ..	4	5	0			
Bushelled scrap	3	10	0			
Cast-iron scrap	3	4	6			
Lancashire—						
Cast-iron scrap	3	12	6			
Heavy wrought	3	7	6			
Steel turnings ..	2	0	0			
London — Merchants' buying prices delivered yard.						
Copper (clean)..	51	0	0			
Brass (clean) ..	40	0	0			
Lead (less usual draft)	30	10	0			
Tea lead ..	26	0	0			
Zinc	26	0	0			
New aluminium cuttings ..	85	0	0			
Braziery copper	46	0	0			
Gunmetal ..	46	0	0			
Hollow pewter	185	0	0			
Shaped black pewter ..	136	0	0			

PIG-IRON.

(*f.o.t. unless otherwise stated*).

N.E. Coast—	
Foundry No. 1 ..	72/6
Foundry No. 3 ..	70/-
Foundry No. 4 ..	69/-
Forge No. 4	68/-
Hematite No. 1 ..	78/6
Hematite M/Nos. ..	78/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	86/-
,, d/d Birm.	94/6
Midlands—	
Staffs common* ..	—
,, No. 4 forge ..	62/6
,, No. 3 foundry	68/-
Shrops. basic	70/-
,, Cold blast, ord.*	185/-
,, ,, roll iron* ..	190/-
* d/d Birmingham.	
Northants forge	57/6
,, fdry No. 3 ..	64/6
Derbyshire forge ..	62/6
,, fdry. No. 3 ..	68/-
,, basic	65/-
Scotland—	
Foundry No. 1 ..	81/6
,, No. 3 ..	76/6
Hem. M/Nos.	76/-
Sheffield (d/d district)—	
Derby forge	66/6
,, fdry. No. 3 ..	72/-
Lincs. forge	67/6
,, fdry. No. 3 ..	70/-
E.C. hematite	88/6
W.C. hematite ..	90/-
Lincs. (at furnaces)—	
Forge No. 4	61/6
Foundry No. 3.. ..	64/-
Basic	63/-
Lancashire (d/d eq. Man.)—	
Derby forge	70/-
,, fdry. No. 2 ..	75/-
Northants foundry No. 3	77/3
Dalzell, No. 3	110/-
Summerlee, No. 3 ..	94/-
Glengarnock, No. 3 ..	94/-
Gartsherrie, No. 3 ..	94/-
Monkland No. 3	94/-
Coltness, No. 3	94/-
Shotts, No. 3	94/-

FINISHED IRON & STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars(cr.)	11	5	0 to	12	10	0
Angles				11	10	0
Tees to 3 united ins.				12	0	0
Nut and bolt ..	10	15	0			
Hoops	14	0	0 to	15	0	0
Marked bars (Staffs.) f.o.t. ..	14	0	0			
Gas strip	12	10	0 to	12	15	0
Bolts and nuts .. ⅝ in. × 4 in. ..	16	15	0			
Steel—						
Ship plates	7	7	6 to	7	17	6
Boiler plts. ..				11	10	0
Chequer plts.	£9	5	to 9	15	0	
Angles	£7	0	0 to	7	5	0
Tees	£8	0	0 to	8	5	0
Channels	£6	12	6 to	7	2	6
Joists	£7	0	0 to	7	5	0
Rounds and Squares 3 in. to 5½ ins. ..		8	0	0		
Rounds under 3 in. to ⅝ in.		7	15	0		
Flats, over 5 in. wide and up ..		8	10	0		
Flats, 5in. to 1½in.		7	10	0		
Rails, heavy ..		8	0	0		
Fishplates		12	0	0		
Hoops (Staffs.) ..		10	10	0		
Black sheets, 24g.		11	5	0		
Galv. cor. sheets, 24g.		16	5	0		
Galv. fencing wire 8g. plain		14	0	0		
Billets,soft	£6	0	0 to	6	2	6
Billets, hard ..		8	2	6		
Sheet bars	6	2	6 to	6	5	0
Tin bars d/d	6	2	6 to	6	5	0

PHOSPHOR BRONZE.

	Per lb.	basis.
Strip	1	3
Sheet to w.g.	1	3½
Wire	1	3½
Rods	1	3
Tubes	1	8
Castings	1	2

Delivery 3 cwt. free
10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	9d. to 1/3
Rolled—	
To 9 in. wide	1/3 to 1/9
To 12 in. wide	1/3½ to 1/9½
To 15 in. wide	1/3½ to 1/9½
To 18 in. wide	1/4 to 1/10
To 21 in. wide	1/4½ to 1/10½
To 25 in. wide	1/5 to 1/11
Ingots for spoons and forks ..	9d. to 1/5½
Ingots rolled to spoon size ..	1/- to 1/8½
Wire round—	
3/0 to 10 G.	1/6½ to 2/1½

with extras according to gauge.

AMERICAN IRON & STEEL.

At Pittsburgh unless otherwise stated.	Dols.
No. 2X foundry, Phila.	24.26
No. 2 foundry, Valley	22.26
No. 2 foundry, Birm.	22.00
Basic	21.76
Bessemer	22.76
Malleable	22.26
Grey forge	21.76
Ferro-mang. 80% d/d	115.00
Bess. rails, h'y, at mill	43.00
O.-h. rails, h'y at mill	43.00
Bess billets	35.00
O.-h. billets	35.00
O.-h. sheet bars ..	36.00
Wire rods	45.00
	Cents.
Iron bars, Phila. ..	2.22
Steel bars	2.00
Tank plates	1.80
Beams, etc.	1.90
Skelp, grooved steel ..	1.90
Skelp, sheared steel ..	1.90
Steel hoops	2.50
Sheets, black, No. 28..	3.35
Sheets, galv., No. 28 ..	4.60
Sheets, blue an'l'd, 9 & 10	2.50
Wire nails	2.65
Plain wire	2.50
Barbed wire, galv. ..	3.35
Tinplate, 100 lb. box	$5.50

COKE (at ovens).

Welsh foundry ..	32/6 to 37/6
,, furnace ..	20/- to 25/-
Durham & North.	
,, foundry	30/- to 33/-
,, furnace ..	17/-
Other Districts, foundry	30/- to 33/-
,, ,, furnace (basis)	11/9

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. Cokes,	20×14, box	19/4½
,,	28×20, ,,	38/9
,,	20×10, ,,	29/-
,,	18¾×14, ,,	20/4½
C.W.	20×14, ,,	17/7½
,,	28×20, ,,	35/1½
,,	20×10, ,,	24/4½
,,	18¾×14, ,,	18/4½

Terneplates 28×20, 35/7½ per box basis f.o.b.

SWEDISH IRON.

Bars,hammered	£18/10 to £19/0
Rolled Ord.	£16/0/0 to£16/10/0
Nail rods	£16 5 0 to £16 15 0
Keg. steel nom.	£33 to £35
Faggot steel nom.	£22 to £25
Blooms, according to quality	£9 to £12
Pig-iron	£6 15 0 to £7 0 0

all f.o.b. Gothenburg.

TUBES AND FITTINGS.

Up to and incl. 6 in.

	Tubes	*Fittings*
Gas	60%	50%
Water	55%	45%
Steam	50%	40%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (Cash).

	£	s.	d.		
Feb. 11	60	2	6	inc.	7/6
,, 12	60	10	0	,,	7/6
,, 15	60	7	6	dec.	2/6
,, 16	59	17	6	,,	10/–
,, 17	59	15	0	,,	2/6

Electrolytic Copper.

	£	s.	d.		
Feb. 11	67	0	0	inc.	15/–
,, 12	67	0	0	No change	
,, 15	67	0	0	,, ,,	
,, 16	66	10	0	dec.	10/–
,, 17	66	10	0	No change	

Standard Tin (Cash).

	£	s.	d.		
Feb. 11	287	10	0	inc.	60/–
,, 12	286	10	0	dec.	20/–
,, 15	288	0	0	inc.	30/–
,, 16	287	15	0	dec.	5/–
,, 17	288	0	0	inc.	5/–

Tin (English ingots).

	£	s.	d.		
Feb. 11	286	0	0	inc	60/–
,, 12	285	0	0	dec.	20/–
,, 15	286	10	0	inc.	30/–
,, 16	286	10	0	No change	
,, 17	286	0	0	dec.	10/–

Zinc Sheets (English).

	£	s.	d.		
Feb. 11	45	0	0	No change	
,, 12	45	0	0	,, ,,	
,, 15	45	0	0	,, ,,	
,, 16	45	0	0	,, ,,	
,, 17	45	0	0	,, ,,	

Spelter (ordinary).

	£	s.	d.		
Feb. 11	35	15	0	dec.	10/–
,, 12	35	17	6	inc.	2/6
,, 15	36	1	3	,,	3/9
,, 16	35	16	3	dec.	5/–
,, 17	35	11	3	,,	5/–

Lead (English).

	£	s.	d.		
Feb. 11	35	0	0	dec.	5/–
,, 12	35	10	0	inc.	10/–
,, 15	35	10	0	No change	
,, 16	35	10	0	,,	,,
,, 17	35	10	0	,,	,,

Exports of Iron Castings in January 1926, compared with January 1925 and 1924.

	January, 1924	January, 1925	January, 1926	January, 1924	January, 1925	January, 1926
BUILDERS' CASTINGS—	Tons.	Tons.	Tons.	£	£	£
Stoves, Grates, etc., Cisterns, Baths, etc., and cooking and washing boilers:—						
To Argentine Republic	59	127	132	2,298	4,200	5,666
,, British South Africa	137	257	385	5,148	10,516	13,063
,, ,, East Indies	49	133	137	3,287	6,904	5,637
,, Australia	56	41	108	3,782	2,188	5,886
,, New Zealand	103	149	150	5,282	7,875	8,823
,, Other countries	503	764	559	26,433	38,137	29,575
Total	907	1,471	1,471	46,230	69,820	68,650
PIPES AND FITTINGS—						
Cast—						
To Argentine Republic	279	777	422	3,658	10,185	5,707
,, British South Africa	400	202	406	5,634	3,288	6,066
,, ,, India	1,019	779	730	20,315	13,716	8,307
,, Straits Settlements and Malay States	844	285	4,794	10,074	3,322	35,191
,, Ceylon	141	146	420	1,704	1,908	4,246
,, Australia	232	269	336	3,835	3,793	6,032
,, Other countries	2,286	4,102	4,189	40,501	65,046	60,097
Total	5,201	6,560	11,297	85,721	101,258	125,646
HOLLOW-WARE—						
Cast, not Enamelled, and Cast, Tinned	409	747	656	18,783	25,253	20,555
,, Enamelled	101	103	87	11,222	8,832	9,254
CASTINGS, in the rough—						
Iron	98	91	97	4,085	4,233	4,132
Steel	1,378	58	104	13,683	1,960	3,252

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

18, BENNETTS HILL, BIRMINGHAM.
11, OLD HALL STREET, LIVERPOOL.
EXCHANGE BLDGS., PORT TALBOT.
FOWLERS BUILDINGS, BOMBAY.
CLIVE STREET, CALCUTTA.
ANGAPPA NAICK STREET, MADRAS.

REGISTERED TRADE MARK
LIMPET

1, HONG KONG ROAD, SHANGHAI.
OCEAN BUILDING, SINGAPORE.
JAVA STREET, KUALA LUMPUR
5, SHAFFRAZ ROAD, RANGOON.
COX'S BUILDINGS, KARACHI.
P.O. BOX 1580, CAIRO.

PIG IRON

SCOTCH, MIDDLESBRO', HEMATITE, BASIC, SPECIALS, &c.,

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE

WILLIAM JACKS & COMPANY,

93, HOPE STREET, GLASGOW.

ROYAL EXCHANGE, MIDDLESBROUGH.

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CONSULTING FOUNDRY ENGINEER, with important British and Foreign practical, technical and commercial experience in all phases of the Foundry industry, specialist in introducing and controlling economical methods of operation and the production of high-grade Cast Irons, Bronzes and other metals, open to act as Technical Consultant and Sales Adviser to established works. On the Engineering side, is familiar with the production of Internal Combustion Engines, Pumps, Railway work, etc., and would consider Directorship, combining the above, with a good firm.—Write Box 622, Offices of THE FOUNDRY TRADE JOURNAL, Bessemer House, 5, Duke Street, Adelphi, London, W.C.2.

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PATENT YOUR INVENTIONS, Trade-mark your Goods. Advice, Handbook and Cons. free.—B. T. KING, C.I.M.E. (Regd. Pat. Agent, G.B., U.S.A., and Can.), 146A, Queen Victoria Street, E.C.4. 36 years' refs. 'Phone 682 Central.

PROPERTY.

TO FOUNDRY OWNERS, WAREHOUSE AGENTS, SAW MILLS and GARAGE PROPRIETORS, etc.

FOR SALE.

Valuable FREEHOLD LAND & BUILDINGS (about 1½ acres), situated on the main line L.M. & S. Railway, and main road to Liverpool, Warrington and Manchester, and known as the Appleton Saw Mills, Widnes, Lancashire; consisting of brick erection, 170 ft. by 60 ft. wide, offices attached; 5 ton electric travelling crane by Royce, Limited, Manchester; four drying sheds, private siding main line, turn table, etc.; two cottages attached by arrangements.

This property was built in 1916 at the cost of about £20,000, and can be purchased at a knock-out price.

Photographs, plans, and permission to view on application to—

SAMUEL OWENS & SON,
WIDNES, Lancs.

MACHINERY

"OLIVER" No. 75 Mechanical Pattern Maker and Universal Wood Milling Machine, with ball bearings; had little use; equal to new; full set tools, accessories, etc.; very low price; photo, full particulars.—FRED BROWN & SON, LIMITED, North Road Works, St. Helens.

ONE 12-ton hand-operated Travelling CRANE, double joist type, span 24 ft. 6 in., by Morris. One 5-ton hand-operated Overhead Travelling CRANE, double joist type, span 30 ft. 6 in., by Morris. One 20-cwt. hand-operated Overhead Travelling CRANE, single joist type, span 26 ft. 6 in., by Morris. One 2-ton ELECTRIC OVERHEAD TRAVELLING CRANE, double girdered type with three motors, by Morris. Also Auxiliary 1-ton Lift, with separate motor, span 35 ft. 9 in. For sale cheap.—For further particulars write Box 626, Offices of THE FOUNDRY TRADE JOURNAL, Bessemer House, 5, Duke Street, Adelphi, London, W.C.2.

MACHINERY, PLANT, &c.

Two 40-in. DUPLEX BORING AND TURNING MILLS, by Webster & Bennett; swivel turret heads and gear-box drive.

Several New 10-in. centres S. S. & S. C. GAP-BED LATHES, admit 52 in. between centres, at £57 10s. each.

Ten New 9-in. centres S. S. & S. C. LATHES, on 8-ft. gap-bed, gear-box feed, at £62 each.

No. 3 "BECKER" VERTICAL MILLING MACHINE, 1¼-in. diam. spindle; working surface of table 2 ft. 9 in. x 10¼ in.

THREE LANCASHIRE BOILERS, 24 ft. x 8 ft., reinsure 105/130 lbs. pressure.

FOUR "BLAKE" PATENT VERTICAL MULTITUBULAR BOILERS, each 12 ft. x 5 ft. diam, reinsure 100 lbs. pressure.

CATALOGUE (10,000 LOTS) ON APPLICATION.

THOS W. WARD, LTD.,
ALBION WORKS, SHEFFIELD.

MACHINERY.—*Continued.*

FOUNDRY PLANT FOR SALE.—Evans' Rapid Tilting Cupola, two Moulding Machines, 80 pairs Boxes for same, etc., etc. — Particulars, write FOUNDRY, 39, Kingsland Road, London, E.2.

SAND MIXERS.—New and second-hand. Ask us to quote.—W. BREALEY & COMPANY, LTD., Russell Street, Sheffield.

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Report of a General Discussion held by The Faraday Society and The Iron and Steel Institute.

Price in Limp Cloth, 8s. 6d.

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BRUSHES, Wire and Soft; all varieties. Send for lists.—LAWSON, WALTON & CO., LTD., Newcastle/Tyne.

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No fee is charged unless actual benefit accrues to clients, who are urged to submit their accounts and computations for opinion, for which no fee is charged.

Personal interviews can be arranged in Glasgow, London, or elsewhere.

M. J. MCCRACKEN, B.L., Tax Consultant,
75, St. George's Place, Glasgow.

BLOWN SEA SAND, in any quantity, as used by Core Makers, Iron and Brass Founders; buy direct and lower your costs; regular deliveries to any quantity; let us quote you; contracts made if desired. —Box 628, Offices of THE FOUNDRY TRADE JOURNAL, Bessemer House, 5, Duke Street, Adelphi, London, W.C.2.

CUPOLAS.

54" CUPOLA, by THWAITES, 6 tons per hour, drop bottom, spark arrester, all pipes and valves, just as new, been very little used, a bargain £100

48" CUPOLA, by THWAITES, as above, but no spark arrester £70

30" CUPOLETTE, by CONSTRUCTIONAL CO., with pipes and fan complete... ... ... £32

NEW LADLES—CHEAP.

12 Ton EVANS	£95
5 Ton McNEIL, enclosed gear	£38
3 Ton THWAITES	£32
2½ Ton by GEORGE GREEN	£30
2 Ton THWAITES	£26
1½ Ton EVANS	£21

BUY FROM ME AND SAVE MONEY.

ALEX. HAMMOND, *FOUNDRY MACHINERY MERCHANT,*
14, AUSTRALIA ROAD, SLOUGH.